Posttraumatic Growth and Disability: On Happiness, Positivity, and Meaning

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Abstract

The field of psychology has traditionally focused on the deleterious effects of adversity to the exclusion of positive effects. However, a literature on positive sequelae of traumatic events has burgeoned over the past decade. The issue of whether individual's reports of positive changes are merely illusory self-enhancing biases or are reflective of objective, quantifiable change is perhaps the most contentious in the posttraumatic growth research at this time. This dissertation begins with a broad overview of the extant research on posttraumatic growth, then presents the evidence supporting each side of the validity debate. As the population studied in this dissertation is adults with traumatic-onset spinal cord injuries, a presentation of research that ties disability to the posttraumatic growth literature follows. Finally, the introductory chapter concludes with an argument for the importance of including a disability perspective in psychological science. Three papers follow, each taking up aspects of this relatively new focus on positive aspects of disability.

The first paper lays the foundation for the work that follows by exploring the question of whether people with disabilities are, in fact, doing well. Establishing a baseline of subjective well-being would seem necessary before venturing into an exploration of how this happiness may have come to be. In a replication of a classic study, I find that indeed, people with spinal cord injuries report levels of happiness that are equal to both those of controls and lottery winners. In the second study, I use experimental and survey evidence collected over a span of eight-years to explore posttraumatic growth and its relationship to emotion regulation advances.

Finally, Paper 3 takes an in-depth look at one of the critical components of posttraumatic growth, a sense of meaning in life, and its relationship to happiness.

The concluding chapter outlines several limitations of this program of research, and provides directions for research that will carry it forward. Finally, it returns to the validity debate in the posttraumatic growth literature most broadly, making recommendations for future research that will shed light on this issue, and presenting reasons that resolution of this debate is important for academia, clinical practice, and society-at-large.

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Traditionally, the field of psychology has focused on trauma as a precursor to psychopathology. There is good reason for this. For most people, in most cases, negative events tend to produce negative consequences (Calhoun & Tedeschi, 2006). There have been equally long traditions however, in the fields of philosophy, literature, and religious studies, of considering the ways in which human suffering offers the possibility for significant good. Indeed, a central theme of much philosophical inquiry--and the work of novelists, dramatists, and poets--has included the possibility of psychological growth from loss (Tedeschi & Calhoun, 1995). In the 20th century, psychological pioneers like Maslow (1954), Frankl (1963), and Yalom (1980), discussed the ways in which critical life crises offered possibilities for positive personal change, and in the 1980s several researchers conducted preliminary studies on positive psychological outcomes of negative events (Affleck et al., 1987; Cella & Tross, 1986). The relatively recent emergence of positive psychology as a field of scientific inquiry has served as a catalyst, and both conceptual work and empirical studies on posttraumatic growth (PTG) have burgeoned over the past decade.

This dissertation presents three papers organized loosely around a central theme: The potential for positive sequelae following disablement. In this introductory chapter I first provide an in-depth description of posttraumatic growth, with special attention paid to the validity of the construct. I follow this by presenting an integration of posttraumatic growth and disability, before making an argument for the importance of including disability in the study of psychological science. Finally, I introduce the three papers presented in this dissertation.

Overview of Posttraumatic Growth

A growing number of studies have documented reports of positive changes resulting from the psychological struggle with trauma and adversity (e.g., Affeck & Tennen, 1996; Helgeson,

Reynolds, & Tomich, 2006; Linley & Joseph, 2004; McMillan, 1999; Park, 1998; Sears, Stanton, & Danoff-Burg, 2003; Zoellner & Maercker, 2005). Theoretical models of posttraumatic growth are generally based on the idea that major life crises present threats to a person's fundamental assumptions about the self and world (Janoff-Bulman, 1992; Tedeschi & Calhoun, 1995; 1996), and that the psychological struggle to cope with these threats can result in positive cognitive, emotional, and behavioral changes, or, according to models that support the illusory nature of PTG, in the perception of these changes.

Studies have reported growth following a range of adverse events, for example, cancer (e.g., Stanton, Bower, & Low, 2006; Collins et al., 1990), HIV (e.g., Ickovics et al., 2004), bereavement (e.g., Davis et al., 1998; Polatinsky & Esprey, 2000), accidents and disasters (e.g., Joseph et al., 1993; McMillen & Cook, 2003), rape (e.g., Burt & Katz, 1987; Thompson, 2000), war and conflict (e.g., Elder & Clipp, 1989; Waysman et al., 2001), and illness and surgery (e.g., Affleck et al., 1987; Tennen et al., 1992). In fact, cases of self-reported growth in the aftermath of traumatic events outnumber cases of psychiatric disorder by a large margin (Quarantelli, 1985; Tedeschi, 1999; Tedeschi & Calhoun, 2004). Only a minority of people exposed to traumatic events develop long-standing psychiatric disorders (Tedeschi & Calhoun, 2004), whereas estimates of the prevalence of growth among people who have experienced trauma tend to range from sizeable minorities (30%-40%) to majorities (60%-80%) (Linley & Joseph, 2004).

Positive outcomes following traumatic stressors are generally reported in three domains: first, changes in the perception of one's self, including an appreciation of one's strength and an awareness of new possibilities for one's life; second, positive changes in the way one relates to other people, such as a greater sense of connection to others and greater compassion for others who have also suffered; and third, changes in one's philosophy of life, especially a changed

sense of what is most important (often greater importance is given to priorities like spending time with family and decreased importance given to financial and materialistic priorities).

Theoretical Concerns about the Validity of PTG

Self-Enhancing Cognitive Biases

Several prominent theories have been put forth that suggest that PTG reports should not be accepted at face value. These theories argue for the widespread tendency to see oneself in an overly positive light, particularly when one's sense of self is threatened.

Cognitive Adaptation Theory. According to cognitive adaptation theory (1983; Taylor & Brown, 1988), people have general self-enhancing cognitive biases as well as specific self-protective cognitive biases for seeing positive in highly negative experiences. Taylor posited that the process of readjustment after a threatening event focuses on three themes: (a) a search for meaning, (b) an attempt to regain mastery over life in general and the event in particular, and (c) an attempt to restore self-esteem through self-enhancing evaluations, particularly social comparisons. A central tenet of cognitive adaptation theory is the illusory nature of peoples' perceptions: "The individual's efforts to successfully resolve these three themes rest fundamentally upon the ability to form and maintain a set of illusions" (Taylor, 1983; p. 1161). "Positive illusions" are not only seen as normative, but as psychologically beneficial.

Taylor (1983) found that breast cancer survivors' attempts at self-enhancement included focusing on specific aspects of one's situation on one which fared well, conducting favorable social comparisons (i.e., downward; "I am more compassionate than she is"), and perceiving positive personal changes. Many responses made by the women were clearly illusory. For example, the vast majority of women reported that they were coping as well as or better than others facing the same challenge (Wood, Taylor, & Lichtman, 1985).

Temporal Comparison Theory. In a development of social comparison theory (Festinger, 1954), Albert (1977) proposed that people also evaluate themselves by comparing their current selves to past selves. He suggested that people have both a need to establish a coherent sense of identity over time and to perceive progressive improvement in themselves, which is achieved by distorting the past and perceiving personal growth. In other words, people construct "downward temporal comparisons" (e.g., "I am more compassionate than I used to be").

McFarland and Alvaro (2000) investigated the impact of self-enhancement motivation on the temporal comparisons of people who had experienced challenging life events. Specifically, they conducted a series of studies with undergraduate university students to examine whether threatened individuals constructed perceptions of personal growth by derogating their past attributes. Their findings supported the hypothesis that perceptions of improvement reflect illusory or exaggerated thinking that is prompted by threatening self-relevant feelings. First, survivors of negative life events were more likely than acquaintances of survivors to perceive greater personal growth after traumatic life events than after mildly negative life events. It is important to note, however, that this was not a true informant study, as discussed below; rather, participants were divided into two groups, the first describing "the most negative life event that had happened to them," the second describing "the most negative life event that had happened to an acquaintance (i.e., someone known casually for over 2 years)." Also, survivors in this study achieved a sense of self-improvement by derogating their earlier attributes rather than idealizing their present attributes. Second, in contrast to people who were randomly assigned to focus temporarily on a mildly negative event, those who focused on a traumatic event reported greater self-improvement. Third, increased perceptions of growth were not shared by acquaintances.

Finally, people who were led to experience negative self-relevant feelings subsequently reported higher levels of personal growth than people who were led to experience more positive feelings, which supports a causal link between threat and illusions of self-improvement.

Coping Strategies

Other theorists have argued that perceptions of growth from threatening life events represent active attempts to cope with trauma and reduce feelings of distress. Two of the most prominent coping theories relevant to PTG are presented below.

Positive reappraisal coping. This coping strategy, also referred to as positive reinterpretation, has been described as an individual's conscious effort to view a negative situation in a way that emphasizes its positive aspects (Scheier, Weintraub, & Carver, 1986). It is commonly measured by the Positive Reappraisal Coping subscale (REAPP) of the COPE, a 60-item questionnaire assessing 15 coping strategies (Carver, Scheirer, & Weintraub, 1989). Items on this subscale include: "I try to see it in a different light, to make it seem more positive;" "I look for something good in what is happening;" "I try to grow as a person as a result of the experience;" and are coded on a scale from 1 = *I don't do this at all* to 4 = *I do this a lot*.

Several studies have provided evidence for the relationship between PTG and positive reappraisal coping. For example, in a study of 259 people with spinal cord injuries, participants who reported high growth showed significantly more use of positive reappraisal coping ($p <$ .001) than people who reported either low or medium growth (Znoj, 1999; as discussed in Zoellner & Maercker, 2006). Park, Cohen, & Murch (1996) also found a significant positive correlation between PTG and positive reappraisal coping ($r = .55$, $p < .01$).

Defensive denial. Use of a defensive coping style (i.e., presenting oneself in an overly positive light and denying the costs of stressful life events) has been proposed as an explanation

for PTG. Several studies have assessed this hypothesis. In a study of people affected by the SARS outbreak, Cheng et al. (2006) used the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960) as a measure of defensiveness, and found that people who reported benefits in the absence of costs scored higher on this measure. McMillen and Cook (2003), in a study of PTG in people with spinal cord injuries, included a measure of denial coping (a subscale of the Situational COPE; Carver, Scheier, & Weintraub, 1989) and found that denial was positively correlated with the reporting of two positive by-products: increased family closeness and material gain (as measured by the Perceived Benefit Scales; McMillen & Fischer, 1998).

Dohrenwend et al. (2004) investigated reports of PTG in relation to various aspects of adjustment in U.S. male veterans of the Vietnam War. Using data from interviews conducted in the National Vietnam Veterans Readjustment Study (NVVRS; Kulka et al., 1990), supplemented by data from military records, Dohrenwend and colleagues assessed the severity of exposure to war-zone stressors, the valence and salience of appraisals of the impact of their service in Vietnam on their present lives, posttraumatic stress disorder (PTSD), and other indicators of wartime and postwar functioning. Defensive denial was operationalized as mainly positive/high salience appraisals of the impact of their service in Vietnam being made despite high rates of current PTSD and problems in postwar functioning (as opposed to mainly positive/high salience appraisals along with low rates of negative outcomes, or mainly negative/high salience appraisals along with high rates of negative outcomes). Indeed, there was a small subgroup of highly exposed veterans with current PTSD who also made mainly positive/high salience appraisals and therefore appeared to be engaging in some form of defensive denial. Thus, it is likely that for some people, reports of PTG are reflective of a defensive coping style rather than veridical growth.

Posttraumatic Growth Assessment

Researchers have explored the phenomenon of posttraumatic growth by using both qualitative and quantitative measures. Both types of measures have strong face validity, are easy to administer, and are readily accepted by research participants (Tennen & Affleck, 2009). However, measures of PTG are not without their flaws, and like all scales that rely on self-report, are subject to bias.

Qualitative Methods

Early studies of growth typically used an interview format with open-ended questions that asked people how their lives had changed in response to a traumatic event (Park & Helgeson, 2006). Interviews often specifically targeted positive life changes resulting from the event (Davis et al., 1998). For example, in an early study of perceived benefits following heart attack, participants were asked "As difficult as it's been, have there been any benefits or gains that wouldn't have occurred if you hadn't experienced the heart attack?" (Affleck, Tennen, Croog, & Levine, 1987). Responses to interview questions were usually categorized into domains of PTG by post hoc statistical analyses. In the analyses, authors determined whether or not there had been any benefit and, in separate analyses, rated the number of reported benefits (Zoellner & Maercker, 2006).

Quantitative Methods

The number of instruments that have been published as quantitative measures of PTG is steadily growing, with at least 14 in use at the time of this writing. Among these, the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) and the Stress-Related Growth Scale (SRGS; Park et al., 1996) have undergone the most psychometric development (Zoellner & Maercker, 2006). The Posttraumatic Growth Inventory is a 21-item self-report

measure comprised of 5 factors: (a) Relating to Others, (b) New Possibilities, (c) Personal Strength, (d) Spiritual Change, and (e) Appreciation of Life. Items include "I discovered that I was stronger than I thought I was," and "I developed new interests." All scale items are positively worded, and respondents are asked to indicate the degree to which each change occurred as a result of their crisis. A 6-point Likert response scale is used, ranging from 0 = *I did not experience this change*, to 5 = *I experienced this change to a very great degre*. The Stress-Related Growth Scale is a 50-item measure reflecting positive changes in three domains: (a) relationships with others (e.g., "A prior relationship with another person became more meaningful"); (b) personal resources, including life philosophy (e.g., "I learned that I want to have some impact on the world"), and (c) coping skills (e.g., "I learned better ways to express my feelings"). Individuals are asked to rate the degree to which they experienced each positive change on a scale from 0 = *not at all*, 1 = *somewhat*, to 2 = *a great deal*.

Potential Sources Of Measurement Bias

As the vast majority of PTG measures rely on the self-reports of participants, reports of growth may be the result of weaknesses of self-report measures in general. It is interesting to consider, however, that self-reported negative changes following adversity seem to be accepted unanimously (Sumalla, Ochoa, & Blanco, 2009). Indeed, a highly utilized way to assess symptoms of psychopathology like depression and anxiety is with self-report measures. We seem willing to accept self-reports about negative sequelae as valid, but not those that are positive (Peterson, 2009). Nevertheless, several specific questions about the validity of the methods used to assess PTG must be answered.

Social desirability. The PTGI and the SRGS, in tests of their psychometric properties, were uncorrelated with measures of social desirability (Tedeschi & Calhoun, 1996; Park, Cohen,

& Murch, 1996). This finding has since been replicated in several studies of PTG (e.g., Smith & Cook, 2004; Wild & Paivio, 2003), suggesting that responses to these scales are not motivated, at least not entirely, by wishes for self-enhancement.

Positive response bias. Illusory reports of growth may be the result of specific measures that produce false positive reports of growth because of a positive response bias. A primary criticism of most of the inventories used to measure positive outcomes of trauma, including the PTGI and the SRGS, is that they do not permit respondents to report negative aspects of their traumatic experience (Park & Lechner, 2006). This may lead to problems with validity in two ways: (a) respondents are not able to report changes about which they are not asked, and (b) respondents may be led to report positive changes that they have not actually experienced. Further, theories such as Taylor's cognitive adaptation theory posit that thinking about threatening events leads people to use self-enhancing positive illusions. Therefore, when asked to think about traumatic life events, people may be more likely to overestimate their growth.

To assess this bias, Smith and Cook (2004) used two methods of measuring posttraumatic growth with the PTGI in a demographically diverse sample, using an experimental design. University students and adults from a superior court jury pool (n = 276) were randomly assigned into one of two groups. In the first group, participants were asked to complete the PTGI in relation to a specific traumatic event (linked group), the way in which the PTGI is normally administered. In the second group, participants were not directed to link their PTGI responses to a particular event but rather to think generally about the past 4 years (unlinked group). Analyses revealed that reports of PTG were higher in the unlinked condition than in the linked condition, particularly in the areas of personal strength and relating to others. Therefore, the findings of Smith and Cook (2004) contradicted notions that current methods of measuring PTG create a

positivity bias, and instead showed that respondents may actually underreport growth on growth scales.

Baker and colleagues (2008) further explored the potential limitation of only allowing respondents to report positive sequelae of adverse events. They developed a measure of posttraumatic depreciation by mirroring the positive items that comprise the Posttraumatic Growth Inventory, i.e., for each of the 21 PTGI items a corresponding negatively worded item was created. Three primary findings resulted: (1) both positive and negative changes were reported in same domains, (2) growth and depreciation were uncorrelated, and (3) positive changes were reported with much greater frequency than were negative changes. These results suggest that posttraumatic growth is a unique and important aspect of traumatic experience, not merely the opposite end of a continuum. Therefore, measuring positive changes separately from those that are negative appears to be justified.

Inability of Current Measures to Capture PTG

A more recent concern, raised by Tennen and Affleck (2009) is that current measures cannot accurately assess PTG due to people's inability to perform the necessary complex mental operations (viz. recalling personal and interpersonal change, and determining to what changes are attributable). Tennen and Affleck cite as examples, respectively, Wilson and Ross's (2001) demonstration that college students cannot accurately recall personal change over a few months, Kirkpatrick and Hazan's (1994) findings that couple's inaccuracy in recalling interpersonal change, and Todd et al.'s (2005) study showing that in contrast to people's reports that they drank alcohol in order to cope with negative affect, the actual association between drinking and negative mood measured in real-time was only moderate. To remedy these challenges to the validity of PTG, Tennen and Affleck, like other researchers, recommend two general changes.

First, they advocate the use of prospective or nearly prospective designs, rather than the cross-sectional or two-wave longitudinal designs that are used in nearly all current studies (for examples of recent prospective studies, see Ransom et al., 2008 and Frazier et al., 2009). Second, the authors recommend explicit assessment of both measured growth (actual change) and recalled growth (perceived change). In addition to testing whether actual positive changes occur, this would require theories of PTG as a positive illusion or coping mechanism to demonstrate that these mechanisms actually predict improvements in adjustment to adverse events.

General Methods Of Validity Assessment

A number of studies have explicitly tested the veridicality of posttraumatic growth. The following section describes the primary techniques that have been used to explore this topic, and the results of these investigations.

Informant Ratings

Self-reported growth tends to be corroborated by others (McMillen & Cook, 2003; Moore et al., 2010; Park, Cohen, & Murch, 1996; Weiss, 2002). In a study of 160 university students, Park et al. (1996) compared participants' responses to the SRGS with those of their friends and relatives. Each student completed the SRGS for their most stressful event in the previous 12 months, rated the event on several dimensions (e.g., initial stressfulness, current stressfulness, perceived success in coping), then nominated a friend or relative to complete the scale on their behalf. Nominated informants were mailed the SRGS and the student's written description of the stressful event, and were asked to rate the types of changes that they had seen in the students as a result of the event described. Informants were also asked to report the length and closeness (i.e., not close, close, extremely close) of their relationship with the student, and the source of their perceptions about the student's growth (e.g., personal observation, statements made by the

student, or third-party reports). Participants' mean SRGS scores did not differ from those provided by their informants, paired $t(67) = .05$, *ns*, and there was a significant positive correlation between participant and informant scores $r(72) = .21$, $p < .05$. Furthermore, when the analysis was limited to informants who reported being "extremely close" to the participants ($n = 57$), the correlation increased to $r(56) = .31$, $p < .05$.

The personal and subtle nature of the type of changes reflected in posttraumatic growth, and the degree of intimacy between some students and their informants may have limited the correlations obtained by Park et al. (1996). Weiss (2002) addressed these issues by assessing the strength of self-informant agreement in women diagnosed with early-stage breast cancer and their husbands. Forty-one women and their husbands completed the PTGI, and the scores were positively correlated ($r = .51$). The greater agreement in assessments of growth may have reflected the greater intimacy of marital partners as compared with that of students and their friends and relatives (Weinrib et al., 2006).

A third study using informant reports adds evidence for the validity of PTG reports. McMillen and Cook (2003) assessed PTG in 42 participants with traumatic-onset spinal cord injuries 18-36 months post-injury. Posttraumatic growth was measured with the Perceived Benefit Scales (PBS; McMillen & Fischer, 1998), which is composed of eight subscales, e.g., Increased Self-Efficacy, Increased Faith in People, and Increased Compassion. Participant ratings of PTG were compared with those of family members, who had been asked to complete the PBS by indicating how well the items described the positive changes that the person with the spinal cord injury had experienced. Mean scores of PTG for spinal cord injured participants were not statistically different from their informants for six of the eight positive by-products assessed by the PBS. A complication of informant report methodology is the difficulty in

determining whether informants are reporting changes that they have actually observed or are merely reporting changes that the participants have verbally described to them. Park et al. (1996) explored this issue by computing additional participant-informant correlations for the subset of students whose informants reported direct observation of positive changes and for the subset of SRGS scale items that represented observable changes. Both sets of correlations increased to approximately .30; suggesting that informant reports reflect more than participants' verbal descriptions.

Control or Comparison Groups

Several studies have used control or comparison groups to test the validity of self-reported posttraumatic growth. Tedeschi and Calhoun (1996) tested the construct validity of the PTGI by comparing the responses of 54 students who reported experiencing at least one major trauma of great severity in the previous year with 64 students who reported none. Since the PTGI purports to measure the benefits of traumatic experience, they hypothesized that the group reporting more severe traumas would report more benefits. Indeed, this was the case, with persons experiencing severe trauma reporting more benefits (M = 83.16, SD = 19.27) than those who did not (M = 69.75, SD = 20.47), ($F(1,113) = 12.33$, $p < .001$).

Cordova, Cunningham, Carlson, & Andrykowski (2001) compared the PTGI responses of a group of women who had survived breast cancer with a healthy group of women matched on age and education. The group of breast cancer survivors indicated how they had changed in the time since diagnosis and the matched controls indicated positive changes that they had experienced in the corresponding amount of time. Survivors' PTGI scores were significantly higher. Tomich and Helgeson (2004) also examined breast cancer survivors, by comparing matched groups of women with more or less severe diagnoses. Participants who had been

diagnosed with more severe disease reported more growth than the group of women with less severe disease. Similarly, Tomich, Helgeson, and Nowak Vache (2005) compared women with breast cancer with a control group of non-affected women, and found that cancer survivors reported growth in a larger number of domains.

Frazier and Kaler (2006) conducted studies with matched comparison groups that did not produce much support for the validity of PTG. In the first study, individuals who had experienced breast cancer (n = 70) did not score higher on measures of growth domains than a matched comparison group (n = 70), except for a measure of spirituality. All data was taken from a large national sample of midlife adults (the Midlife in the United States Survey, or MIDUS). However, this study was not designed to measure PTG so Frazier and Kaler's findings are drawn from available measures (e.g., ratings of personality traits and interpersonal responses to stress), which may have limited their ability to detect differences.

Tests of Discriminant and Convergent Validity

An additional concern is that posttraumatic growth is merely an alternate expression of another positive psychological construct on which individuals differ, such as optimism, hope, or religiosity. This possibility has been explored in a number of studies. Based on low or null correlations, most researchers have concluded that it is not (Park & Helgeson, 2006). For example, Milam (2006) found that while self-reported increases in spirituality after HIV diagnosis predicted slower disease progression in a sample of 412 people followed for an average length of 18 months, posttraumatic growth (measured with the PTGI) did not, except for Hispanics and those low in optimism (measured with the Life Orientation Test; LOT; Scheier & Carver, 1985). In Sears et al.'s (2003) longitudinal study of women with breast cancer, optimism (also measured with the LOT) did not predict PTG, either at study entry or at 12-month follow-

up. In this same study, hope, measured by Snyder et al.'s Hope Scale (1991), which assesses perceived successful goal-directed energy and the ability to generate plans to achieve goals, was also uncorrelated with PTG.

Tedeschi and Calhoun (1996) assessed the convergent and discriminant validity of the PTGI. To detect whether reports of growth were the result of participants' wishes to present socially desirable responses, the Marlowe-Crowne Social Desirability Scale (Crowne & Marlowe, 1960) was administered. The NEO Personality Inventory (Costa & McCrae, 1985) was administered to examine the relations between perceiving benefits and the personality characteristics of Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. Because optimists tend to perceive and emphasize the positive aspects of experiences, the Life Orientation Test (LOT) (Scheier & Carver, 1985) was used. Finally, because increases in religiosity have been reported, a three-item measure of religious participation (Pressman, Lyons, Larson, & Strain, 1990) was included. As predicted, the PTGI was unrelated to social desirability, and was positively correlated with optimism ($r = .23$, $p < .01$) and religious participation ($r = .25$, $p < .01$). Also as predicted, the PTGI was moderately and positively correlated with extraversion ($r = .29$, $p < .01$) and openness ($r = .21$, $p < .01$), and was not correlated with neuroticism.

Park et al. (1996) also conducted several tests of convergent and discriminant validity. As predicted, the SRGS was unrelated to social desirability (as measured by a 20-item short form of the Marlowe-Crowne Social Desirability Scale) ($r = .00$). The SRGS was positively correlated with a one-item rating of event-related growth ($r = .46$, $p < .001$), initial stressfulness of event ($r = .18$, $p < .001$), current stressfulness ($r = .14$, $p < .001$), and Impact of Event Scale score ($r = .31$, $p < .001$).

Weinrib, Rothrock, Johnsen, and Lutgendorf (2006) conducted an assessment of the construct validity of the PTGI in a sample of 163 community-dwelling women. Participants completed the PTGI, the Marlowe-Crowne Social Desirability Scale (MCSD), the Profile of Mood States—Short Form (POMS-SF), the Psychiatric Epidemiological Research Interview (PERI) Life Events scale, and wrote essays about the impact of a stressful life event that were coded for growth and depth of processing. Results showed that higher PTGI scores were correlated with greater positive mood and greater depth of processing in essays, and that there was no relation between reports of growth and negative mood or socially desirable responding. Importantly, independent ratings of growth in the essays were associated with higher PTGI scores, indicating that people who endorse growth on standardized questionnaires are able to describe and elaborate on the nature of growth that has occurred.

Frazier and Kaler (2006) found that specific PTG domains (measured by Perceived Benefit Scale subscales) assessed in undergraduate students (n = 96) were not uniquely related to corresponding measures of well-being (e.g., family closeness, empathy, gratitude). After controlling for positive affect, the PBS subscales were not more highly correlated with the corresponding well-being measures than to the other well-being measures and in some cases were more highly related to measures in other domains (e.g., self-efficacy). However, this study may have been limited by well-being measures that did not map precisely onto the PBS subscales and events that were not sufficiently stressful to produce PTG.

Mental and Physical Health Correlates

Posttraumatic growth has been linked to psychological and physical health, findings that are often taken to support the validity of the construct. For example, in a meta-analytic review of PTG studies, (Helgeson, Reynolds, & Tomich, 2006), it was found that greater PTG was related

to less depression and more positive well-being. Similarly, Algoe and Stanton (2009) report that PTG is associated with increases in positive well-being, particularly positive affect. Frazier, Conlon, and Glaser (2001) found that women who reported positive changes at both 2 weeks and 12 months after experiencing sexual assault had lower depressive symptoms than women who reported no positive changes at either time.

Results have consistently shown a positive correlation between objective measures of physical health and posttraumatic growth (Bower, Moskowitz, & Epel, 2009). In one of the first studies of this relationship, Affleck, Tennen, Croog, and Levine (1987) found that PTG in men 7 weeks after a heart attack predicted lower incidence of a second heart attack and lower morbidity 8 years later. Subsequent studies of individuals with HIV have found positive effects of PTG on physiological systems. For example, Bowers, Kemeny, Taylor, and Fahey (1998) found that greater incidence of PTG in HIV-positive men 4 days to 18 months after the AIDS-related death of a close friend or partner predicted decreased immune system decline (CD4 counts) 2-3 years post-bereavement and lower AIDS-related mortality 7 years later. Studies with cancer survivors have found decreases in cortisol and increases in aspects of immune function for those who found benefits from their experiences (McGregor & Antoni, 2009). In an experimental study that assigned women with breast cancer to either write about positive aspects of or facts about their experience found that those who wrote about benefits had fewer subsequent medical appointments for cancer-related problems (Stanton et al., 2002).

Neurological Measures

Although not expressly designed to test the validity of PTG, Rabe, Zollner, Maercker, and Karl (2006) conducted a study that found neurological correlates of PTG in people who had been in serious accidents. Eighty-two survivors of severe motor vehicle accidents completed the

PTGI, a measure of trait and state affect (PANAS), diagnostic interviews assessing clinical disorders, and measurement of electroencephalographic activity. Models of brain asymmetry and emotion propose that left-hemisphere regions of the prefrontal cortex are involved in positive emotion and approach-related behavior, and studies have found greater relative left-sided activity to be associated with well-being and positive affective style (Rabe et al., 2006). As predicted, a significant positive correlation was found between greater perceived PTG and greater relative left-sided fronto-central activity (as indexed by EEG alpha power asymmetry), (r = .34, p <.001). The correlation with PTG remained significant even when trait positive affect was statistically controlled.

The State of the Science

Although much remains to be learned about the validity of posttraumatic growth, the extant research has shed considerable light on this contentious issue. Research has demonstrated that perceptions of growth result in part from the derogation of one's past attributes and reflect a normative tendency for self-enhancement (e.g., McFarland & Alvaro, 2000; Taylor, 1983). Other research suggests that reports of PTG reflect actual, verifiable change (Park, Cohen, & Murch, 1996; Weiss, 2002). Further, the evidence suggests that different conceptualizations of PTG (i.e., coping process versus outcome) represent related, but distinct, constructs.

Posttraumatic growth may be both real and illusory. Dohrenwend et al. (2004), describe the conclusions of Sledge and his colleagues (1980) after examining US Air Force pilots and navigators who had been held captive during the Vietnam War. There appeared to be two distinct groups of survivors. "The researchers were impressed by the veterans' reports of positive personal benefits from their captivity and felt that these appraisals served two very different functions for different veterans: [Sledge et al. observed that] 'For some POWs, the sense of

having been changed favorably by captivity is clearly a defensive maneuver aimed at denying a deeper sense of having been impaired, both physically (some do have enduring disabilities) and psychologically (in terms of mental functioning).' By contrast: '[O]ther POWs … have approached their lives with a new set of values concerning work, family, and relationships with others, and insist that they are wiser, more content, and know themselves and their environment better. They responded to the challenge of captivity as an opportunity to experience their human limits, and they defined their abilities and limitations more sharply than most people ever will.' (pp. 430-431)." For one group of participants, reports of positive growth outcomes appeared to be authentic, for the other, illusory.

Tennen and Affleck (1998) differentiated between coping by searching for evidence of benefits (benefit finding), coping by consciously reminding oneself of perceived benefits (benefit reminding), and concluding that one has indeed experienced benefits from a negative life event. Similarly, Zoellner and Maercker (2006) in their review of PTG studies, concluded "The presentation of different concepts for the phenomenon of PTG has artificially opposed PTG as a coping strategy to PTG as an outcome of coping. However, many theorists acknowledge that posttraumatic growth can be both, coping style and coping outcome, and that these two modes can include differentially adaptive proportions (p. 631)." Findings from Frazier et al. (2009) support the general conclusion that perceived and actual growth reflect different processes. In a study of undergraduates that assessed pre- and post-trauma reports of PTG, perceived growth was associated with increased distress, whereas actual growth was related to decreased distress.

In one of the most rigorous tests of this idea, a longitudinal study of women with breast cancer, Sears, Stanton, and Danoff-Burg (2003) differentiated between positive reappraisal coping ("the intentional and repeated use of benefit-related information as a coping strategy")

measured with the REAPP, and benefit finding ("the simple identification of benefit [from adversity])" measured by the question "Have there been any benefits that have resulted from your experience with breast cancer?" finding the two constructs to have distinct predictors and outcomes. They further differentiated the predictors and outcomes of PTG (measured by the PTGI) from both benefit-finding and positive reappraisal coping. Demographic, personality, and stressor-related characteristics predicted different constructs. For example, education and optimism uniquely predicted benefit finding at study entry, hope uniquely predicted positive reappraisal coping, and time since diagnosis and perceived stress uniquely predicted PTG at 12 months. Further, positive reappraisal coping—but not benefit finding—at study entry predicted better perceived physical health and more positive mood at 3 and 6 months and PTG at 12 months.

In one of the few prospective studies of PTG, Ransom, Sheldon, and Jacobsen (2008) measured reports of personal goals and positive attributes of patients before and after radiotherapy for breast or prostate cancer. In the Time 2 assessment, posttraumatic growth was assessed with the PTGI. Ransom and colleagues found that PTG was significantly related to perceived increases (but not actual increases) in positive attributes and actual increases (but not perceived increases) in the relative importance of intrinsic versus extrinsic goals. Further, the measures were not unrelated to one another, suggesting that actual positive change and memory biases independently contribute to self-reported PTG. Therefore, rather than asking *if* posttraumatic growth is illusory or veridical, a better question may be *when* is PTG illusory and when is it veridical.

Variations in whether reported PTG is beneficial, and when it is illusory or veridical, may depend on characteristics of the individual (e.g., demographic variables like sex, ethnicity, and

age, or personality attributes like optimism and extraversion), stressor characteristics (time since event, severity), cognitive processes (control and threat appraisals; optimistic versus pessimistic explanatory style), features of the particular domain of PTG (e.g., changed philosophy of life, improved relationships, or reordered priorities), or some combination of these features. For example, demographic variables like ethnicity may affect the authenticity of growth because the notion of growth from adversity can be construed in different ways in different cultures. Gunty et al. (2010), in a recent moderator analysis of PTG, found that reports of less distress and greater life satisfaction determined those individuals for whom perceived growth was most strongly related to actual growth. These findings support the idea that PTG can be both veridical and illusory for different people, and adds the promising possibility that this difference can be detected.

Disability and Posttraumatic Growth

Research regarding the impact of disability and other forms of health-related adversity, like the majority of research on trauma outcomes, stresses loss. Traditional theories of disability emphasize loss and decline, and common stereotypes of living with physical challenges are largely negative (Wright, 1983). While these events often do produce predictable maladaptive responses that foster further problems (e.g., chronic depression), particularly in the early stages, there is also evidence in the literature that indicates otherwise. For example, a number of researchers have documented that people with a severe chronic illness report a level of quality of life (QOL) neither inferior nor better than that of less severely ill patients or healthy people (Cassileth et al., 1984), and even patients with a life-threatening disease or disability were found to report a stable QOL (Andrykowski, Brady, & Hunt, 1993). Additionally, health care

providers and significant others tend to underestimate patients' level of contentment as compared to patients' reports of their own level of contentment (Sprangers & Aaronson, 1992).

Spinal cord injury (SCI), a disability acquired through traumatic onset, and focused on in the studies that follow, has received increased attention in recent years as a significant portion of the American population has been impacted. Schulz and Decker (1985), in a study of adults with SCI, found that despite the obvious impact their injuries had on them, participants saw themselves on average as being better off than most people, with or without a disability. Diener & Diener (1996) reviewed studies that indicated that all American socioeconomic groups score above neutral life satisfaction, as do people with this severe disability. Finally, Silver (1982) reported that individuals with SCI were very unhappy immediately following their injury, but that 58% stated that happiness was their strongest emotion by the third week after their injuries.

Janoff-Bulman & Berger (2000) pointed out that people do not make such changes "in spite of their losses and sense of vulnerability, but because of them" (p. 39). From this perspective it seems reasonable to look at the ways that disability may create conditions that foster coping and personal growth. Rather than being a universally negative experience, disability may deepen individuals' understanding of life and be interpreted positively. Thus, reports of increased depression and greater awareness of death do not necessarily contradict reports of increased appreciation of life. Rather, mature schemas may be more complex and contain multiple, once seemingly exclusive, views simultaneously. Indeed, research on the complexity of schemas suggests that mature schemas are more complex than immature schemas (Linville, 1982, 1987; Linville & Jones, 1980). Likewise, Tedeschi & Calhoun (1995) refer to this product of posttraumatic growth as wisdom, and describe it as an appreciation for paradox. Collins, Taylor, and Skokan (1990) asked 55 cancer patients about the changes in their lives, and

their findings exemplify this phenomenon. The patients reported negative changes in their views of their world and themselves, while at the same time they reinterpreted their experiences positively (perceived benefits, reordered priorities).

Importance of Disability Research

Scientific psychology has long aspired to be universalistic. Many researchers have worked to discover principles of behavior applicable to all of humanity. Unfortunately, it has not turned out to be so easy. Cognitive mechanisms and social responses thought to be basic processes of human functioning have turned out to be culturally variable and context-dependent. Though the similarities are often greater than the differences, the variables of ethnicity, gender, and age, among others, matter.

Included among these important variables is disability. Why is it so important to include a disability perspective in the science of psychology? First, disability is not the experience of a minority of people. Either due to a personal condition or that of a loved one, it is an experience that will touch most people at some point during their lives. Second, the aging of the "baby boomer" generation will result in unprecedented numbers of people with disabilities living in the nation. This vast demographic change will have ramifications for all aspects of society. Third, significant economic, political, and social challenges remain for people with disabilities in achieving full inclusion and integration. However, despite the increasing prevalence of people with disabilities and the challenges they face, remarkably little empirical research exists regarding the cognitive and emotional impact of disability across the lifespan. Psychological scientists are in a unique position to research, understand, and address the issues that this large and diverse segment of our society experiences.

Largest Minority

Due to post World War II advances in life expectancy and survivorship, individuals living with disabilities, regardless of which definition is used, now comprise the single largest minority group ever identified in the United States (Campbell, 1996a; Campbell, 1996b). In fact, disability is truly an "equal opportunity minority;" anyone can join, at any time, regardless of ethnicity, age, gender, or socioeconomic status.

Today, a full 20 percent of the U.S. population, or over 54 million Americans, live with disabilities (Centers for Disease Control and Prevention [CDC], 2006). Half of these are severe disabilities, affecting the ability to perform basic life functions, such as walking, seeing, or hearing (CDC; Department of Health and Human Services [DHHS], 2001). The numbers for spinal cord injuries alone are staggering: more than 250,000 spinal cord-injured individuals are now living in the United States, and another person joins their ranks every hour of every day (Buoniconti Fund to Cure Paralysis, 1995). In addition, there are over 25 million family caregivers and millions more who provide aid and assistance to people with disabilities (DHHS, 2001).

Add chronic, disabling illnesses to the equation, including the one million children with juvenile diabetes, 8.2 million people with cancer, 4 million with Alzheimer's, 60 million people with heart disease, 10 million people battling osteoporosis, 43 million living with arthritis, and 30,000 people with Lou Gehrig's disease (Langevin, 2001), and it is hard to imagine that anyone is left untouched by the experience of disability.

Shifting Demographics

On the horizon are the anticipated effects of the aging of the "baby boomer" generation, those born between 1946 and 1964, which will result in unprecedented numbers of people with disabilities (Administration on Aging, 2001; Campbell, 1996b). According to the new National

Coalition on Disability and Aging, there are approximately 75 to 85 million Americans -- or one-third of the nation -- who are aging with long-term disabilities or aging into disability for the first time in later life (Campbell, 1996b). Moreover, as the population ages, more Americans will have illnesses and chronic conditions that limit their ability to carry out ordinary tasks, such as bathing, rising from a chair, opening a window, and walking to the grocery store. The proportion of older adults needing personal assistance with everyday activities increases with age, from 9 percent of those aged 65-69 up to 50 percent of those aged 85 or older. With a current life expectancy of 75 years, newborns today can expect to experience an average of 13 years with an activity limitation (Administration on Aging, 2001). Because the 85-plus group is the fastest growing segment of the population, many Americans may live with activity limitations for 20 years or more.

Despite the increasing prevalence, little research exists describing the process of aging with disability. In fact, data on aging are typically missing from most empirical studies of life-long disability. At a theoretical level, we need more knowledge of the changing nature and meaning of disability at different stages of the life course and across different social contexts. It is becoming a priority to incorporate concepts from both gerontology and disability studies into cross-disability and cross-cohort research on aging with and aging into disability in mid- to later-life. Theoretically integrated and collaborative research strengthens ties between these areas by equipping members of both research communities with the data needed to improve the quality of life for people of all ages with disability.

Significant Challenges

Though progress has been made in the twenty-two years since Congress passed the Americans with Disabilities Act (ADA), significant challenges remain for people with

disabilities in achieving full inclusion and social integration. Surveys by the National Organization on Disability (NOD, 2004; DHHS, 2001) have highlighted these persistent obstacles:

•Americans with disabilities have a lower level of educational attainment than those without disabilities (one out of five adults with disabilities has not graduated from high school, compared to less than one of ten adults without disabilities).

•Americans with disabilities are poorer and more likely to be unemployed than those without disabilities (unemployment rates for working-age adults with disabilities have remained at the 70 percent level for the past 30-plus years).

•Many Americans with disabilities remain outside the economic and social mainstream of American life (71 percent of people without disabilities own homes, but fewer than 10 percent of those with disabilities do; and people with disabilities vote at a rate that is 20 percent below voters without disabilities, partially due to inaccessible polling places -- the most recent Federal Election Commission report states that at least 20,000 of the Nation's polling places are inaccessible to people with disabilities).

During his term as President of the American Psychological Society, John Darley (2001) outlined some objectives for increasing the impact of psychology's role in informing public policy. Important among these is a forward gaze allowing us to predict shifts in our world that likely will surface on the pubic policy agenda. Given the vast demographic shift to a more senior population with a higher percentage of individuals with disabilities, paired with the significant obstacles to living with a disability now, disability issues seem a good place to put one's energy. Currently, the published literature in this area is surprisingly limited, particularly given the magnitude and potential costs of the needed federal policies.

The Present Research

The following three papers tie together and extend the literatures on posttraumatic growth and disability, focusing specifically on happiness, the positivity effect, and meaning. First, I establish that people with disabilities are, in fact, happy. This is crucial to setting the stage for the papers that follow. Without a foundational exploration of the well-being of people with disabilities, it would seem unnecessary to pursue an analysis of components of posttraumatic growth, namely emotion regulation via the positivity effect and the role of a sense of meaning in life. I conclude by summarizing the research presented in this dissertation, discussing several important limitations, and presenting fruitful areas for future research.

(Under review)

Lottery winners and accident survivors: Happiness is relative

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Abstract

Adaptation level theory contends that the impact of extreme events will be attenuated by the processes of contrast and habituation, and individuals will eventually return to their pre-event levels of happiness. A classic study by Brickman, Coates, and Janoff-Bulman (1978), which compared the subjective happiness of lottery winners, controls, and individuals with spinal cord injuries, is often used as evidence in support of this contention. However, only partial support for the theory was found. Brickman et al. demonstrated that lottery winners were not happier than controls, but that people with spinal cord injuries were significantly less happy than winners and controls. In Study 1 of the present research, Brickman et al.'s study was repeated, with a critical modification: the average number of years elapsed since the paralyzed participants' injuries was extended from 1 to 19. With this adjustment, no differences in happiness levels between the three groups were found. These results persisted when gender, age, education, race/ethnicity, religiosity, and marital status were taken into account. Study 2 indicated that these null findings were not due to the particular measures used nor the use of a hedonic, as opposed to eudaimonic, conceptualization of well-being. The results are discussed with respect to their theoretical and practical implications.

Keywords: hedonic adaptation, happiness, well-being, lottery winners, spinal cord injury

Lottery winners and accident survivors: Happiness is relative

In a classic study entitled, "Lottery winners and accident victims: Is happiness relative?" Brickman, Coates, and Janoff-Bulman (1978) presented dramatic evidence that both extremely positive and extremely negative events have a relatively weak relation to happiness. Brickman and colleagues found that lottery winners were not happier than non-winners, and individuals who had sustained traumatic-onset paralysis scored above neutral on measures of general happiness and daily pleasures. That is, lottery winners were not particularly happy and accident survivors were not particularly sad.

This provocative and counterintuitive finding led the Brickman et al. (1978) paper to become the "most famous article in the psychological literature on wellbeing" (Schkade & Kahneman, 1998). However, it may also be one of the most misinterpreted articles. Although it is often cited as providing strong evidence for adaptation to even extreme events, the findings of Brickman et al. were actually mixed (Diener, Lucas, & Scollon, 2006a; Easterlin, 2003; Frederick & Loewenstein, 1999; Lucas, 2007a). Lottery winners were indeed no happier than non-winners, but what is often not reported is that people with paralysis were significantly less happy than people in the other groups. This effect was quite large; when Diener and colleagues (2006) calculated the effect size of the comparison they found that the average control participant was happier than 78% of spinal cord injured participants.

Despite its influence on the field and frequent citation, in the approximately three-decades since its publication, this study has never been replicated nor its methodological weaknesses addressed. The aim of the present research is to conduct a more rigorous test of Brickman et al.'s (1978) findings and to investigate related questions regarding hedonic adaptation.

Hedonic Adaptation

Adaptation level theory posits that the value of a given reward is not absolute, but is relative to the other rewards with which it is compared (Brickman & Campbell, 1971; Helson, 1964). Interpreted within the framework of this theory, Brickman and colleagues (1971; 1978) posited that there are two factors that work to mitigate the impact of extreme events, contrast and habituation. In contrast to an extremely positive event, daily activities that were once experienced as pleasurable will lose their appeal, and in the long run, the initial thrill of the event will dissipate as individuals habituate to their good fortune. Adaptation level theory also predicts that the same processes will hold true for extremely negative events. In contrast to the anchor of the adverse event, happiness derived from daily pleasures will be enhanced. Over time, as individuals become accustomed to the challenge, the process of habituation will erode their unhappiness. If all of these suppositions are true, and happiness following extremes of good and bad fortune differ little, then it could be concluded that happiness is entirely relative.

A formulation of this theory, the set-point model, holds that due to inborn personality traits, happiness fluctuates around a genetically determined set point that is largely resistant to change (e.g., Headey & Wearing, 1989, 1992). A considerable amount of empirical evidence has supported this claim. Recent reviews have revealed that 30 to 40% of the variance in happiness remains stable over at least 20 years (Lucas, 2007b). Further studies have demonstrated that all demographic variables taken together account for only about 20% of variance in happiness (Campbell, Converse, & Rodgers, 1976; Diener et al., 2006; Diener, Suh, Lucas, & Smith, 1999). Even factors commonly assumed to be strongly related to happiness, such as health and beauty, correlate only weakly with reports of well-being (Diener, Wolsic, & Fujita, 1995; Okun & George, 1984).

Does Money Buy Happiness?

When it comes to happiness, surely money matters? In general, research has demonstrated a remarkably small association between wealth and happiness. Diener, Sandvik, Seidlitz, and Diener (1993) found that the correlation between subjective well-being and income in the United States was only .13. Even the richest Americans (those with annual earnings of above $10 million), were found to be only trivially happier than their less wealthy peers (Diener, Horwitz, & Emmons, 1985). Within the United States, where personal income has nearly tripled in the last century, average happiness has not increased (Easterlin, 1974; Easterlin, McVey, Switek, Sawangfa, & Zweig, 2010). Although there is a moderately strong correlation between wealth and well-being between countries (Diener et al., 1993), wealth per se is not driving this association. In a study of 100 thousand people from 45 countries with widely varying per capita income levels, happiness and income were strongly correlated. However, when human rights were controlled for, this association was eliminated (Diener, Diener, & Diener, 1995). More recently, Kahneman and Deaton (2010) added an important nuance to the money-happiness relationship research. The researchers reviewed surveys of 450,000 Americans and found that emotional well-being ceased to increase after individuals reached an annual income of $75 thousand. However, when respondents were asked how well they thought their lives were going, life satisfaction continued to increase with income. (I will return to the issue of separable components of happiness in more detail in Study 2.)

Performing a persuasive test of the relation between money and happiness is difficult however, due to the stringent requirements for constructing an ideal data set, most notably the lack of random assignment of money among individuals (Diener & Biswas-Diener, 2002; Gardner & Oswald, 2007). Studying lottery winners, therefore, offers a particularly compelling

test of this relationship. In the small number of studies that have examined the happiness of lottery winners, results are mixed. In a longitudinal study of 137 lottery winners drawn from a panel of randomly chosen people in the United Kingdom, Gardner & Oswald (2001) found that those who received windfalls had higher well-being and lower mental stress in the following year. A win of approximately $75,000 was associated with a rise in well-being of 0.1 to 0.3 standard deviations (therefore about 1.5 million dollars would be needed to move someone from the bottom to the top of a well-being frequency distribution). In comparison to those with no wins and those with small wins, Gardner and Oswald (2007) found that individuals who had medium-sized wins (approximately US $1,500 to $170,000), went on to eventually show significantly better psychological health. However, in a study of UK National Lottery (1999) winners, the size of the win did not affect the happiness of the winner. Those who won approximately $70 thousand to $230 thousand were as likely to be happier following their win as were those who won more than $1.5 million. In this study, a little over half (55%) of winners claimed to be happier than they were before after winning. Forty-three percent responded that they were about the same (largely due to the fact that they were happy before their win), and 2% reported that they were less happy. Neither of these studies assessed whether gains in well-being dissipated many years after the win however, the question that is crucial to studies of hedonic adaptation.

Happiness After Adversity

For most people, in most cases, negative events tend to produce negative consequences. However, both theoretical work and empirical studies of positive sequelae of negative events have burgeoned over the past two decades. Studies have reported benefits following a range of adverse events, for example, cancer (e.g., Collins, Taylor, & Skokan, 1990; Stanton, Bower, &

Low, 2006), HIV (e.g., Ickovics et al., 2004), bereavement (e.g., Davis, Nolen-Hoeksema, & Larson, 1998; Polatinsky & Esprey, 2000), accidents and disasters (e.g., Joseph, Williams, & Yule, 1993; McMillen & Cook, 2003), rape (e.g., Burt & Katz, 1987; Thompson, 2000), war and conflict (e.g., Elder & Clipp, 1989; Waysman, Schwarzwald, & Solomon, 2001), and illness and surgery (e.g., Affleck, Tennen, Croog, & Levine, 1987; Tennen, Affleck, Urrows, Higgins, & Mendola, 1992). In fact, cases of self-reported growth in the aftermath of traumatic events outnumber cases of psychiatric disorder by a large margin (Quarantelli, 1985; Tedeschi, 1999; Tedeschi & Calhoun, 2004). Only a minority of people exposed to traumatic events develop long-standing psychiatric disorders (Tedeschi & Calhoun, 2004), whereas estimates of the prevalence of growth among people who have experienced trauma tend to range from sizeable minorities (30%-40%) to majorities (60%-80%) (Linley & Joseph, 2004).

Furthermore, high levels of well-being and adaptation have consistently been found in diverse populations facing extreme adversity. Frederick and Lowenstein (1999) reviewed studies of individuals who are incarcerated, finding substantial adaptation following a stressful initial period of adjustment (Flanagan, 1980; MacKenzie & Goodstein, 1985; Wormith, 1984; Zamble, 1992), and even soldiers placed in solitary confinement during the Vietnam war showed high levels of adaptation (Suedfeld, Ramirez, Deaton, & Baker-Brown, 1982). Further, people encountering health-related adversity and disability generally show levels of well-being that are high, and often not different from controls. For example, Riis et al. (2005) found evidence of hedonic adaptation to hemodialysis; patients were no less happy than healthy people. Patterson and colleagues (1993) reviewed studies of survivors of severe burn injuries one year after the accident and found high levels of psychosocial adaptation. Tyc (1992) reviewed empirical studies of young adults who had lost limbs due to cancer and found high quality of life and low

psychiatric symptoms. Andrykowski, Brady, and Hunt (1993) found that patients with a life-threatening disease or disability reported a stable quality of life (QOL), and other researchers found that individuals with a severe chronic illness reported a level of QOL that was not inferior to that of less severely ill patients or healthy people (Cassileth et al., 1984).

In the specific case of spinal cord injury, Silver (1983) found that although people who had sustained paralysis reported strong negative emotions 1 week after their accidents, only 7 weeks later they reported that their strongest emotion was happiness. Schulz & Decker (1985) studied adults with spinal cord injuries and found that participants saw themselves on average as being better off than most people, with or without a disability. In addition, Wortman and Silver (1987) found that people with tetraplegia reported negative affect levels similar to those of control participants. Further, in a study of people with high-level tetraplegia (lesions at C4 or above), 92% of participants reported that they were glad to be alive and 86% of the group reported that they enjoyed an average or better than average quality of life (Gerhart, Koziol-McLain, Lowenstein, & Whiteneck, 1994).

Revisiting the Hedonic Treadmill

More recent research concerning people who have experienced adversity has accumulated, some of which contradicts the assumption of ubiquitous and complete adaptation to adverse change, such as unemployment and divorce (Lucas, 2005; Lucas, Clark, Georgellis, & Diener, 2004). The rehabilitation literature also reveals mixed results regarding subjective well-being. Dijkers (1997, 1999) reviewed studies of the life satisfaction of individuals with spinal cord injuries, finding that life satisfaction scores are lower than those of people without disabilities. In a large study of individuals who had applied for government benefits due to disability-induced inability to work, satisfaction with life had declined more than a standard

deviation from that reported before the disabling event (Lucas, 2007a). Lucas concluded that adaptation does not occur in the case of long-term disability. Taking the divorce, unemployment, and disability findings together, Lucas drew a number of conclusions, including, "happiness levels do change, adaptation is not inevitable, and life events do matter" (2007a; p. 78).

Rationale for the Current Studies

Why the discrepancy? As there are substantial bodies of research that both support and refute the hedonic treadmill hypothesis, it remains unclear whether the set-point model accurately captures the phenomenon of adaptation. In attempting to unravel this discrepancy, as Brickman et al.'s 1978 study is the original study from which much of the other adaptation research was inspired, it seemed to make sense to start at the beginning. In the current series of studies, I twice attempt to replicate the findings of Brickman et al., and to extend previous research on adaptation in several substantive and methodological ways. Accordingly, in the studies to be presented here, the sample sizes have been increased, the minimum threshold of lottery winnings raised, potential confounding variables included, and the amount of time elapsed since the critical event extended.

The latter modification is perhaps the most important. Time since event has repeatedly been found to relate to adaptation trajectories, and to differ depending on the valence of the event. In general, hedonic adaptation is more rapid for gains than for losses (Strahilevitz & Loewenstein, 1998). For example, in a 15-year longitudinal study of reactions to changes in marital status, Lucas and colleagues (2003) found that although people adapt quickly to marriage, widowed individuals took almost 8 years to return close to their initial baseline levels of happiness. Lundqvist et al. (1991) and Dijkers (1999) found that life satisfaction for people with spinal cord injuries improves with increased time since injury. Similarly, Oswald &

Powdthavee (2008) find that average life satisfaction drops after the onset of a moderate disability, but fully recovers to the predisability level after two years. In a recent prospective longitudinal study of 479 males who had acquired long-term work-limiting disabilities, results demonstrated that although participants exhibited reduced life satisfaction at the onset of disability, after 6 years, there were no differences between people with and without disabilities (Pagán-Rodríguez, 2010).

In that the participants in the current studies were on average two decades post-injury and one decade post-winning, these studies contribute an important modification to Brickman et al., (1978), in which participants were selected to be no more than 1-year post-event. In fact, Brickman and colleagues noted in discussing the limitations of their study that their "interpretation would be vastly strengthened, however, if our sample had included people in the… equally critical many years after the event, for whom habituation should be complete" (1978; p. 924). Therefore, in the current studies I corrected this limitation, postulating that increased time since injury or winning would foster greater adaptation.

Study 2 explores important differences in the measurement and conceptualization of happiness. Most cross-sectional survey research and the extant longitudinal studies of disability adaptation (Lucas, 2007a; Oswald & Powdthavee, 2008; Pagán-Rodríguez, 2010) have employed single items to assess happiness (Diener & Deiner, 1996). However, much research has found that happiness can be deconstructed into multiple components that may or may not be correlated (Diener, Lucas, & Scollon. 2006). Study 2 uses multiple multi-item measures that are widely used and psychometrically validated, thus allowing comparison with other populations and examination of different components of subjective well-being.

An important distinction in the conceptualization of happiness, drawn from competing philosophical traditions, has emerged in the literature. Hedonic well-being focuses on maximizing pleasure and minimizing pain. In contrast, eudaimonic well-being holds that true happiness entails identifying, cultivating, and living in accordance with ones virtues (Aristotle, trans. 1985). Although measures of hedonia and eudiamonia are correlated, the constructs also have important differences. The extant research on adaptation, however, does not often make this distinction. In Study 2, both hedonic and eudaimonic measures are included to explore the relation between adaptation and these two models of happiness.

Study 1

Study 1 examined the central hypothesis that increased the time since the critical event would produce evidence of complete hedonic adaptation. Like in the Brickman et al. (1978) study, lottery winners were not predicted to be happier than controls. In contrast to the Brickman et al. study and to the recent work by Lucas (2007a), however, it was predicted that there would no longer be significant differences between the happiness ratings of people with disabilities and controls or lottery winners. Therefore, I predicted that this study would support the set-point model of happiness and the idea of a hedonic treadmill.

Method

Participants

Lottery winners. The first fifty-two participants who had won at least $1 million in the lottery and responded to recruiting letters mailed by the Executive Directors of the New York (approximately 1,400 letters were mailed) and Massachusetts State Lotteries (188 letters were mailed) were included. Data from 2 participants were excluded as they completed less than 10% of the survey questions, providing a final sample of 50 lottery winners. The letters directed

interested participants to a web address for an online survey. Minimum amount won was increased to $1 million from the $50,000 threshold used in Brickman et al. (1978) to satisfy criticism that the null findings had been due to the small size of the lottery winnings. Indeed, previous research with lottery winners has shown that well-being increases and mental stress decreases with the amount of the windfall (Gardner & Oswald, 2001). As with all groups, the online survey was closed when the desired sample size was reached; thus it is not possible to calculate response rates.

Spinal cord injury (SCI) survivors. Fifty spinal cord injured participants were recruited by personal referrals within the Greater Boston area, social networking websites, an SCI online forum, and a national organization that puts out a monthly online newsletter addressing the concerns of people with disabilities. All recruitment materials directed interested participants to the web address of the SCI survey.

Controls. Fifty control participants, i.e., people who were neither lottery winners nor spinal cord injured, were directed to the survey website examining "experiences of daily life," through invitations posted on a social networking website (www.facebook.com), notices posted in the community, and flyers that were handed out in the Greater Boston area.

Measures

All participants were asked to indicate their gender, age, number of years of education, race/ethnicity, whether or not they were religious/spiritual, and whether or not they were in a long-term (defined as greater than 1 year) committed romantic relationship. The sample included people with different background characteristics to provide a stringent test of the hypothesis in a diverse sample. These general background variables were also collected so that they could later be included in analyses as covariates.

The spinal cord injury literature presents numerous reports of other factors that may influence post-injury well-being (Buckelew, Baumstark, Frank, & Hewett, 1990; Bulman & Wortman, 1977; Coyle, Lesnik-Emas, & Kinney, 1994; Krause & Sternberg, 1997). These include: time since injury, age at onset of injury, level of injury (tetraplegia versus paraplegia), completeness of injury (complete versus incomplete, an indicator of functional ability), and cause of injury. Thus, an additional questionnaire was included in the SCI survey to assess these characteristics. In addition, lottery winners were asked several questions specific to winning: amount won, year won, and the form in which they had chosen to accept the prize (i.e., annuity or lump sum).

Participants were asked to rate three general happiness questions, on a scale from 0 = *Not at all* to 5 = *Very much*. First, they were asked, “How happy are you now (not at this moment, but at this stage of life)?” Second, “How happy were you before winning the lottery (for the lottery group), being spinal cord injured (for the SCI group), or 6 months ago (for the control group). Finally, participants were asked to rate how happy they expected to be in a couple of years. As a measure of the amount of happiness they derived from daily activities, participants were asked to indicate how pleasurable each of the following seven events was for them: talking with a friend, watching television, eating breakfast, hearing a funny joke, getting a compliment, reading a magazine, and buying clothes. Ratings were made on a 6-point scale ranging from 0 = *Not at all* to 5 = *Very much*.

All participants were also asked to answer the rate the statements, "I think that spinal cord injury (paralysis) is" and “I think that winning the lottery is” on a scale from 0 = *The worst possible thing that could happen in a lifetime* to 5 = *The best possible thing that could happen in a lifetime.*

Procedure

All recruiting materials contained a website address to each group's respective online survey. To replicate Brickman et al. (1978) as closely as possible, control surveys mentioned only that the survey pertained to daily life, while the lottery winner and accident survivor surveys mentioned their special status. Study 2 of Brickman et al. demonstrated that using different cover stories for the surveys did not alter the interpretations of results. After reading informed consent and instruction pages, participants were asked to complete a battery of questionnaires that assessed aspects of psychological well-being. As an incentive for participation, a donation of $25 to a charity of the participant's choice was made for completing the questionnaire battery in full.

Results

Preliminary analyses

One hundred and fifty participants took part in this study (50 participants in each group), with 45% of the people with spinal cord injuries, 46% of the lottery winners, and 65% of the controls being female. As in the Brickman et al. (1978) study, White participants held a consistent majority across groups, constituting 85% of the control, 71% of the SCI, and 87% of the lottery winner groups. About half of the controls (42%) and SCI participants (48%) responded that they were religious or spiritual, compared with 87% of lottery winners. Fifty-seven percent of controls, 48% of SCI participants, and 73% of lottery winners indicated that they were in committed long-term romantic relationships. On average, the control group was the youngest (M = 34.33, SD = 9.91), followed by the SCI group (M = 44.00, SD = 13.00) and finally the lottery winner group (M = 55.83, SD = 14.86). This difference was significant, $F(2, 143) = 34.68$, $p = .000$, $\eta_p^2 = .327$. Total number of years of education also differed significantly across groups, $F(2, 144) = 17.19$, $p = .000$, $\eta p2 = .193$. Controls had the most years of education

(*M* = 18.22, *SD* = 2.60), followed by the SCI group (*M* = 16.74, *SD* = 3.26) and the lottery winner group (*M* = 14.81, *SD* = 2.74). The ANCOVA analyses reported later include these background variables as covariates to account for the demographic differences between the groups, and for the possible confounding effects of these variables, as gender, age, education, race/ethnicity, religiosity, and relationship status have all reliably been found to be correlated with well-being (for a review, see Argyle, 1999). Please see Table 1.1 for correlations of demographic variables and happiness measures. In correlational and regression analyses, missing data were deleted listwise.

Correlation Coefficients for Demographic Variables and Happiness Measures in Study 1

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
1. Present Happiness	3.73	1.15	--											
2. Past Happiness	3.41	1.40	.39***	--										
3. Future Happiness	4.23	0.91	.61***	.28**	--									
4. Daily Pleasures	3.33	0.86	.39***	.17*	.20*	--								
5. SCI Worst/Best	1.60	1.06	.15	.01	-.02	.05	--							
6. Lottery Worst/Best	3.61	0.88	.09	.04	.04	.28**	-.15	--						
7. Gender	.51	.50	.20*	.01	.11	.12	.13	-.04	--					
8. Age (years)	44.22	15.09	.08	.07	-.21*	.11	-.07	.12	-.06	--				
9. Race/ Ethnicity	.83	.38	.13	.08	.16	.12	-.21*	.15	.05	.04	--			
10. Education (years)	16.73	3.19	-.00	-.08	.09	-.17	.23**	-.16	-.02	-30***	-.08	--		
11. Relationship Status	.60	.49	.28**	.16	.10	.18*	-.23**	.21*	-.10	.15	.13	-.12	--	
12. Religiosity	.58	.50	.13	.12	.04	.23**	-.07	.07	.06	.30***	.07	-.29**	.16	--

Note. Gender: 0 = *male*, 1 = *female*; race/ethnicity: 0 = *non-White*, 1 = *White*; relationship status: 0 = *not in a long-term (> 1 year) romantic relationship*; 1 = *in a long-term romantic relationship*; religiosity: 0 = *not religious or spiritual*, 1 = *religious or spiritual*. Listwise $N = 139$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

At the time of their injuries, the spinal cord injured participants were, on average, 25.26 years old (*SD* = 14.88), with an average of 18.50 years (*SD* = 12.62) since their injuries. Fifty-five percent of participants were paraplegics, and 45% were tetraplegics. Forty-nine percent had complete injuries while 51% were incomplete. All were full-time wheelchair users. Fifty percent had been injured in car accidents, 12% had been injured in diving accidents, and the remaining 38% were fairly evenly split between other sport and recreational activities, disease/illness, falls, gun violence, and other causes. For spinal cord injured participants, completeness of injury was correlated with daily pleasures, $r(46) = .43$, $p = .002$. An independent-samples *t*-test indicated that scores on daily pleasures were significantly higher for individuals with incomplete injuries ($M = 3.75$, $SD = .66$) than for individuals with complete injuries ($M = 3.15$, $SD = .63$), $t(47) = 3.29$, $p = .002$. In addition, greater age at time of injury was associated with lower predictions of future happiness $r(46) = -.43$, $p = .002$ and less daily pleasures $r(46) = -.33$, $p = .02$. Length of time since injury, cause of injury, and level of injury (i.e., whether the person was a paraplegic or tetraplegic) were not related to any happiness measures. This latter finding is noteworthy, as intuitively, one would expect that injury level would be negatively related to happiness: the higher the injury is on the spinal cord, the less physical functioning someone has, creating an increase in resource demands (DeRoon-Cassini, Valvano, & de St. Aubin, 2009).

Lottery winners had won an average of 6.01 million dollars (*SD* = 10.01) with a range from 1 to 55 million. On average, 8.02 years had passed since the event of winning (*SD* = 6.23). Seventy-four percent of winners had chosen to receive an annuity while 26% chose to receive the prize in the form of a lump sum. A greater number of years post-win was significantly associated with lower predicted future happiness, $r(49) = -.44$, $p = .002$, consistent with a habituation effect. The way in which the lottery winnings were awarded, that is, whether the winner received an

annuity or a lump sum, also had a statistically significant relationship with future happiness, $r(50) = .33$, $p = .33$), such that individuals who received lump sums expected greater happiness in the future ($M = 4.92$, $SD = .28$) than did those who received annuities ($M = 4.27$, $SD = .96$), $t(48) = 2.40$, $p = .02$. Amount won was not related to any measures of happiness.

Analysis of Covariance

General Happiness and Daily Pleasure. Table 1.2 shows the estimated marginal means and standard errors for all happiness measures.

Table 1.2

Estimated Marginal Means[a] (& Standard Errors) of Happiness Measures for each Group in Study 1

	General Happiness			Daily Pleasure
	Present	Past	Future	
Control	3.62_b (.19)	3.29_b (.24)	4.02_b (.14)	3.23_b (.14)
SCI	3.66_b (.16)	3.70_b (.21)	3.93_b (.12)	3.52_b (.12)
Lottery Winner	3.94_b (.20)	3.24_b (.26)	4.78_c (.15)	3.25_b (.15)

	SCI Worst/Best	Lottery Worst/Best
Control	1.56_b (.17)	3.64_b (.15)
SCI	2.01_b (.15)	3.58_b (.13)
Lottery Winner	1.20_c (.18)	3.62_b (.16)

Note: SCI = Spinal cord injured. Means in the same column that do not share subscripts differ at $p < .05$ in a Bonferroni comparison. $N = 150$.

[a]Adjusted for gender, age, education, race, religiosity, and relationship status.

Perhaps most strikingly in that the finding is contrary to that of the original Brickman et al. (1978) study, an analysis of covariance revealed that there were no statistically significant differences between groups on the measure of present happiness, controlling for gender, age, education, race/ethnicity, religiosity, and relationship status (see ANCOVA results in Table 1.3).

Table 1.3

Summary of Analysis of Covariance for General Happiness and Daily Pleasures in Study 1

Source	*SS*	*df*	*MS*	*F*	η_{p^2}
Present Happiness					
Gender	9.38	1	9.38	7.90**	.057
Age	0.00	1	0.00	0.00	.000
Race	0.80	1	0.80	0.68	.005
Education	1.49	1	1.49	1.25	.010
Relat. Status	13.32	1	13.32	11.22**	.079
Religiosity	0.32	1	0.32	0.27	.002
Group	1.61	2	0.80	0.68	.010
Error	154.43	130	1.89		
Total	2121.00	139			
Past Happiness					
Gender	0.23	1	0.23	0.12	.001
Age	0.02	1	0.02	0.01	.000
Race	1.57	1	1.57	0.80	.006
Education	0.25	1	0.25	0.13	.001
Relat. Status	5.63	1	5.63	2.88†	.022
Religiosity	2.01	1	2.01	1.03	.008
Group	5.34	2	2.67	1.37	.021
Error	253.98	130	1.95		
Total	1886.00	139			
Future Happiness					
Gender	1.37	1	1.37	1.99	.015
Age	10.58	1	10.58	15.33***	.105
Race	1.10	1	1.10	1.59	.012
Education	2.05	1	2.05	2.97†	.022
Relat. Status	0.84	1	0.84	1.21	.009
Religiosity	0.01	1	0.01	0.01	.000
Group	12.80	2	6.40	9.27***	.125
Error	89.75	130	0.69		
Total	2602.00	139			
Daily Pleasures					
Gender	1.71	1	1.71	2.52	.019
Age	0.01	1	0.01	0.04	.000
Race	1.03	1	1.03	1.52	.012
Education	0.53	1	0.53	0.79	.006
Relat. Status	2.50	1	2.50	3.68†	.028
Religiosity	2.61	1	2.61	3.84†	.029
Group	2.21	2	1.10	1.62	.024
Error	88.38	130	0.68		
Total	1646.27	139			

Note. Relat. Status = relationship status. Gender: 0 = *male*, 1 = *female*; race: 0 = *non-White*, 1 = *White*; relationship status: 0 = *not in a long-term (> 1 year) romantic relationship*; 1 = *in a long-term romantic relationship*; religiosity: 0 = *not religious or spiritual*, 1 = *religious or spiritual*. Listwise $N = 139$

†$p < 1.0$. *$p < .05$. **$p < .01$. ***$p < .001$.

Likewise, there was no statistically significant effect for past happiness by group, controlling for the six variables listed above. Again, this is in contrast to the findings of Brickman et al. (1978), in which the spinal cord injured participants exhibited what was termed a *nostalgia effect*, or a tendency to idealize the past. There was, however, a significant effect of group on predictions of future happiness. A Bonferroni corrected pairwise comparison of the difference between the future happiness of lottery winners and controls was statistically significant ($p = .000$), as was the Bonferroni corrected pairwise comparison of the difference between lottery winners and SCI participants ($p = .000$). The comparison of the difference between controls and SCI participants was not statistically significant ($p = 1.00$). In other words, while controls and SCI participants had similar estimates of their future happiness, both groups had lower estimates than did lottery winners. Finally, there was not a statistically significant difference between groups on ratings of daily pleasure.

Best/Worst Events. The majority of participants in all groups rated wining the lottery as a highly positive event, with a mean of 3.61 on a scale of 0 to 5 ($SD = .88$), and, controlling for gender, age, education, race, religiosity, and relationship status, there were no between-group differences, $F(2, 130) = .051$, $p = .95$, $\eta_p^2 = .001$. Contrary to popular press notions that winning the lottery may be more of a curse than a blessing because of additional problems that are created, such as strained social relations, lottery winners rated winning very highly relative to the best thing that could happen in life.

Analysis of covariance showed a main effect of group on ratings of whether spinal cord injury is the worst or best thing that could happen in a lifetime, $F(2, 130) = 6.74$, $p = .002$, $\eta_p^2 = .094$. Post hoc analyses using a Bonferroni corrected pairwise comparison indicated that lottery winners thought paralysis was significantly worse than did spinal cord injured participants ($p =$

.002) but not controls (p = .60). Ratings of controls were not significantly higher than those of SCI participants (p = .13). It is interesting to note that using 2.50 as a neutral point, 21, or approximately half, of paralyzed participants indicated that their spinal cord injury was closer to the best than the worst thing that could happen in a lifetime. Although most lottery winners rated winning highly and some spinal cord injured participants gave a low rating to becoming paralyzed, the majority of both sets of responses were not at the extremes. That is, participants could imagine events that were subjectively better than winning the lottery and worse than being disabled. Indeed, as was the case in the original study, correspondence with both winners and spinal cord injured individuals revealed that they believed that happiness was most associated with activities like interactions with loved ones and meaningful work.

Study 2

In Study 2, I sought to replicate and extend these results using new participant samples, so that I could both assess the robustness of these findings and examine additional questions. First, the same happiness measures that were used in Brickman et al. (1978) and in Study 1 of the current research were again administered to 25 participants in each of the lottery winner, spinal cord injured, and control conditions. Second, analyses of two different, psychometrically validated, measures of happiness were conducted. Finally, a measure that captures the eudaimonic, as opposed to hedonic, model of happiness was administered.

Defining Happiness

In the three decades since Brickman et al.'s (1978) seminal study was performed, and particularly since the growth of positive psychology in the past decade, a large body of literature has grown concerning the definition and measurement of happiness. Subjective well-being (SWB), the term most commonly used in happiness research, divides happiness into two

components: emotional well-being and cognitive evaluations of life satisfaction. Emotional happiness refers to the frequency of the experience of two factors: high positive affect (e.g., excitement, enthusiasm, inspiration) and low negative affect (e.g., fear, guilt, anger). Cognitive happiness refers to a global sense of satisfaction with life.

Research has shown these constructs are correlated, yet distinct (e.g., Diener, 1984). Using multitrait-multimethod matrix analyses Lucas, Diener, and Suh (1996) demonstrated that positive affect is discriminable from negative affect and that life satisfaction is discriminable from both positive and negative affect. These different components of well-being can move in different directions over time (Diener, Lucas, & Scollon, 2006). Positive emotions might increase at the same time as life satisfaction decreases, or positive emotions might decrease in tandem with negative emotions. Indeed, positive and negative emotions are only weakly correlated with each other (e.g., Diener, Emmons, Larsen, & Griffin, 1985) and are correlated with different predictor variables. For instance, (Diener, Ng, Harter, & Arora, 2010) found that income is strongly associated with evaluations of life satisfaction but only modestly related to positive and negative affect. Further, some of the different factors that constitute happiness may be more subject to adaptation than others. For example, Lucas (2007a) found that although life satisfaction ratings of people with work-related disabilities did not adapt over time, emotional distress levels did. In other words, "happiness" cannot be defined as a unitary construct and is best assessed using multiple, multi-item measures.

In the second part of Study 2, happiness was divided into three factors, life satisfaction, positive emotions, and negative emotions in order to address the following question: Do the primary results from Study 1 (that is, no statistically significant differences between the present happiness levels of the three groups), hold for both cognitive and emotional happiness, or do

some components of well-being adapt more readily than others? To answer this question, the most widely used multiple-item subjective well-being scales, the Postive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) and the Satisfaction with Life Scale (SWLS; Diener et al., 1985), were administered to the three groups of participants. The PANAS is internally consistent, stable over time, and has excellent convergent and discriminant correlations with lengthier measures of the underlying mood factors. The SWLS shows good convergent validity with other types of assessments of subjective well-being, and consistently has Cronbach's alpha scores of about .80, which are considered reliable (see Pavot & Diener, 1993, for a review). The use of multiple, multi-item, psychometrically validated measures of positive well-being is in contrast to the three prospective longitudinal studies of disability and adaptation conducted by Lucas (2007a), Oswald and Powdthavee (2008), and Pagan-Rodriguez (2010), which asked a single question, rated on a scale of 0 to 10: "How satisfied are you with your life, all things considered?" and Brickman et al. (1978) in which present happiness was assessed with the question "How happy are you now?" rated on a scale of 0 to 5. Indeed, when Lucas (2007a) conducted a second study in which he administered a measure of psychological distress along with the life satisfaction item, he found that adaptation levels differed depending on the measure used.

A further distinction was explored in Study 2. The above conceptualization of happiness, that is, low negative affect, high positive affect, and high life satisfaction generally depicts hedonia. As mentioned earlier, a second model of well-being, eudaimonia, has increasingly gained traction in the literature. A critical difference between the two models is the relationship of the state to its source. Hedonic pleasure is conceptualized as a state to be sought, regardless of the source, whereas the state of eudaimonia can be seen as a product of the pursuit of self-

actualization. It is the virtuous activities that are the source of this latter form of well-being, rather than the well-being itself, that are the goal of human life. However, little attention has been paid to the implications of source differences on the occurrence, speed, and completeness of adaptation (Waterman, 2007). It is possible, for example, that happiness that is derived from using ones skills to overcome a challenge will not revert to baseline as rapidly as will satisfaction that is gained from material goods. These two forms of well-being, hedonia and eudaimonia, were measured to assess potential differences in adaptation effects.

Method

Participants

Lottery winners. Participants were 25 winners of at least $1 million from the Illinois State Lottery. As in Study 1, the Executive Director mailed a recruiting letter to approximately 1,300 past winners, directing interested participants to an online survey link. The survey was closed after the desired sample size was reached.

Spinal Cord Injured. The sample of 25 spinal cord injured individuals was recruited from an SCI online forum, and a national organization that puts out a monthly online disability newsletter, social networking websites, and by personal referrals from the greater Boston area. All recruitment materials directed interested participants to the web address of the SCI survey.

Controls. Twenty-five control participants were recruited through invitations posted on a social networking website, notices posted in the community, and by handing out flyers in the Greater Boston area.

Measures

The first group of questions was identical to that used in Study 1. Participants were asked to specify various demographic characteristics, to rate their past, present, and future happiness, to

complete evaluations of daily pleasures, and to rate the events of acquiring a spinal cord injury or winning the lottery on a scale from the worst to best things that could happen in a lifetime. In addition, the three new scales described below were administered.

Satisfaction With Life Scale (SWLS; Diener, Emmnos, Larsen, & Griffin, 1985). The SWLS is a 5-item scale measuring global life satisfaction, the cognitive component of subjective well-being (α = .92). Respondents indicate the degree to which they agree with each of the 5 statements, such as, "In most ways, my life is close to ideal." Answer choices range from 1 to 7, anchored by *strongly disagree* and *strongly agree.* Responses are summed and scores range from 5 to 35.

Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS is a 20-item questionnaire assessing emotional experience in general. Participants are asked to indicate on a 5-point Likert-type scale the degree to which they feel each emotion on the list on average. Positive emotions include excited, inspired, and determined, while negative emotions include afraid, irritable, and hostile. Responses are summed separately for the positive affect (PA; α = .92) and negative affect (NA; α = .90) scales (10 items each) and scores range from 10 to 50 for each scale.

Psychological Well-Being Scales (PWB; Ryff, 1989). The PWB is an 18-item measure of eudaimonic well-being (α = .82). Respondents are asked to indicate the degree to which they agree with each statement, using a 6-point Likert response format. Response choices range from 1 to 6 (0 = *strongly disagree*; 6 = *strongly agree*). Scale items are both positively and negatively worded. The items constitute 6 subscales: (a) autonomy), (b) environmental mastery, (c) personal growth, (d) positive relations with others, (e) purpose in life, and (f) self-acceptance.

Procedure

All recruiting materials contained a website address for each group's respective online survey. The survey began with participants completing an online consent form and reading an instruction form. Participants then completed a battery of questionnaires assessing various aspects of well-being, including the three additional measures. As an incentive for participation, a donation of $25 to a charity of the participant's choice was made for completing the questionnaire battery in full.

Results

Preliminary analyses

As in Study 1, analyses reported later include important background variables as covariates as there were a number of demographic differences between the groups. Seventy-one percent of controls, 76% of spinal cord injured participants, and 67% of lottery winners were female. White participants again held a consistent majority across groups, constituting 64% of controls, 100% of SCI participants, and 92% of lottery winners. A larger percentage of lottery winners indicated that they were religious or spiritual (76%), compared with about half of the controls (56%) and half of the SCI group (48%). More controls (64%) and lottery winners (76%) indicated that they were in committed long-term romantic relationships than did participants with spinal cord injuries (44%). An univariate ANOVA revealed a statistically significant difference for age, $F(2, 72) = 52.08$, $p = .000$, $\eta_p^2 = .591$; lottery winners ($M = 62.28$, $SD = 14.83$) were older than both controls ($M = 37.32$, $SD = 10.59$) and SCI participants ($M = 33.20$, $SD = 4.97$), but controls and SCI participants were not significantly different from each other. A significant difference for years of education was also found, $F(2, 72) = 5.49$, $p = .01$, $\eta_p^2 = .132$. Spinal cord injured participants ($M = 15.84$, $SD = 1.82$) did not differ from controls ($M = 17.36$, $SD = 2.43$)

or lottery winners (*M* = 14.80, *SD* = 3.66), but controls were significantly more educated than lottery winners. Missing data were deleted listwise in correlational and regression analyses.

Spinal cord injured participants had been paralyzed for an average of 15.98 years (*SD* = 5.09), with an average age at injury of 17.22 years (*SD* = 4.57). All used wheelchairs full-time. Seventy-two percent of individuals had been injured in motor vehicle accidents, and the remaining 28% had a fairly even split between diving, other sports and recreational activities, disease/illnesses, falls, and gun violence. Sixty-eight percent of SCI participants were paraplegics and 32% were tetraplegics, with 36% having complete injuries and 64% having incomplete injuries. Greater time since injury was associated with lower reports of past happiness, $r(25) = -.41$, $p = .04$. This suggests that the longer someone had been injured, the less they tended to idealize the past. Cause, completeness, age at injury, and whether participants were paraplegics or tetraplegics were not related to any measures of happiness.

For lottery winners, on average, 14.84 years (*SD* = 10.77) had elapsed since the event of winning, with an average prize of 5.92 million dollars (*SD* = 10.29) (range = 1 to 52 million). Seventy-two percent of winners received their prizes in the form of an annuity, while 28% chose a lump sum. Years post-win was negatively associated with present happiness, $r(25) = -.45$, $p = .02$, such that the winners were less happy the greater the amount of time that had elapsed since winning. Greater years post-win was also associated with less daily pleasure, $r(25) = -.40$, $p = .05$. Amount won and whether the award was received in the form of an annuity or lump sum were not related to any happiness measures.

Analysis of Covariance

General Happiness and Daily Pleasure. As was the case in Study 1, an ANCOVA revealed that there was no statistically significant difference in present happiness between the three

groups, $F(2, 61) = 0.76$, $p = .47$, $\eta_p^2 = .024$, controlling for gender, age, education, race, religiosity, and relationship status. Also as found in Study 1, there were no significant differences between groups on ratings of past happiness, $F(2, 61) = .78$, $p = .46$, $\eta_p^2 = .025$, further suggesting that, with time, spinal cord injured individuals ceased to idealize the past. In contrast to Study 1, in which SCI participants and controls were found to have lower predictions of their future happiness than did lottery winners, no such between-group differences were found in Study 2, $F(2, 59) = .77$, $p = .47$, $\eta_p^2 = .025$. Also in contrast to Study 1, there was a statistically significant difference in the amount of daily pleasure experienced by the different groups, $F(2, 59) = 5.29$, $p = .01$, $\eta_p^2 = .148$, such that lottery winners ($M = 4.01$, $SE = .23$) reported higher daily pleasure than did SCI participants ($M = 3.00$, $SE = .17$), although not more than controls ($M = 3.53$, $SE = .17$). This is in striking contrast to the original Brickman et al. (1978) study, in which the daily pleasure ratings of lottery winners were significantly lower than those of controls, though not less than SCI participants.

Best/Worst Events. An ANCOVA revealed a main effect of group on ratings of spinal cord injury as the worst or best thing that could happen in a lifetime, controlling for gender, age, education, race, religiosity, and relationship status, $F(2, 61) = 4.20$, $p = .02$, $\eta_p^2 = .121$. Post hoc analyses using a Bonferroni corrected pairwise comparison indicated that lottery winners thought that paralysis was significantly worse than did control participants ($p = .02$) but not worse than did participants with spinal cord injuries ($p = .27$). The ratings of SCI participants did not differ significantly from control participants ($p = .48$). When using 2.50 as a hypothetical neutral point, more than half of paralyzed participants (14 of 25) indicated that their spinal cord injury was closer to the best than the worst thing that could happen in a lifetime. Analyses were not

conducted for the lottery Worst/Best measure because it was not administered to all groups in this study.

Life Satisfaction and Emotional Well-being. Please see Table 1.4 for estimated marginal means and standard errors of the SWLS and the PANAS. An ANCOVA revealed that there were no statistically significant differences between groups on ratings of life satisfaction, controlling for gender, age, education, race, religiosity, and relationship status, $F(2, 61) = 1.54$, $p = .23$, $\eta_p^2 = .048$ (Table 1.5). Similarly, no statistically significant differences between groups on positive affect ratings were found, $F(2, 61) = 1.66$, $p = .20$, $\eta_p^2 = .052$. Finally, there were no statistically significant differences in negative affect between the three groups, $F(2, 61) = .99$, $p = .38$, $\eta_p^2 = .032$.

Table 1.4

Estimated Marginal Means[a] (& Standard Errors) of Subjective Well-Being Measures for each Group in Study 2

Group	Life Satisfaction	Positive Affect	Negative Affect
Control	26.77_b (1.66)	34.69_b (1.88)	19.85_b (1.71)
SCI	23.44_b (1.72)	35.78_b (1.95)	18.06_b (1.76)
Lottery Winner	28.37_b (2.28)	41.19_b (2.58)	15.44_b (2.34)

Note: SCI = Spinal cord injured. Means in the same column that do not share subscripts differ at $p < .05$ in a Bonferroni comparison. Listwise $N = 70$.

[a]Adjusted for gender, age, education, race, religiosity, and relationship status.

Table 1.5

Summary of Analysis of Covariance for Cognitive and Affective Happiness in Study 2

Source	*SS*	*df*	*MS*	*F*	η_p^2
			Life Satisfaction		
Gender	166.14	1	166.14	3.20†	.024
Age	2.33	1	2.33	0.05	.000
Race	114.40	1	114.40	2.20	.017
Education	32.57	1	32.57	0.63	.005
Relat. Status[a]	167.50	1	167.50	3.23†	.024
Religiosity	0.15	1	0.15	0.00	.000
Group	76.93	2	38.47	0.74	.011
Error	67.47	130	51.90		
Total	93636.00	139			
			Positive Affect		
Gender	0.04	1	0.04	0.00	.000
Age	14.25	1	14.25	0.26	.002
Race	160.08	1	160.08	2.94†	.022
Education	93.85	1	93.85	1.72	.013
Relat. Status	34.46	1	34.46	0.63	.005
Religiosity	1.57	1	1.57	0.03	.000
Group	34.89	2	17.45	0.32	.005
Error	7080.81	130	54.47		
Total	209223.62	139			
			Negative Affect		
Gender	48.00	1	48.00	1.08	.008
Age	88.95	1	88.95	2.00	.015
Race	51.43	1	51.43	1.15	.009
Education	1.32	1	1.32	0.03	.000
Relat. Status	2.22	1	2.22	0.05	.000
Religiosity	87.83	1	87.83	1.97	.015
Group	0.13	2	0.06	0.00	.000
Error	5795.81	130	44.58		
Total	51832.04	139			

Note. Relat. Status = Relationship Status. Gender: 0 = *male*, 1 = *female*; race: 0 = *non-White*, 1 = *White*; relationship status: 0 = *not in a long-term (> 1 year) romantic relationship*; 1 = *in a long-term romantic relationship*; religiosity: 0 = *not religious or spiritual*, 1 = *religious or spiritual*. Listwise $N = 70$.

†$p < 1.0$. *$p < .05$. **$p < .01$. ***$p < .001$.

Eudaimonic Well-being. Table 1.6 displays the estimated marginal means and standard

errors of the Psychological Well-being (PWB) scales. Controlling for gender, age, education, race, religiosity, and relationship status, ANCOVAs revealed that there were no significant differences between groups on total PWB scores, $F(2, 61) = 1.64$, $p = .20$, $\eta_p^2 = .051$, or on any subscale scores.

Table 1.6

Estimated Marginal Means[a] *(& Standard Errors) of Eudaimonic Happiness Scales for each Group in Study 2*

Scale	Control	SCI	Lottery Winner
Autonomy	14.00_b (0.56)	15.00_b (0.57)	15.10_b (0.76)
Environmental Mastery	13.76_b (0.76)	14.12_b (0.79)	15.18_b (1.05)
Personal Growth	15.39_b (0.54)	16.30_b (0.56)	15.68_b (0.74)
Positive Relatedness	14.08_b (0.74)	14.44_b (0.76)	15.74_b (1.01)
Purpose in Life	14.38_b (0.60)	14.17_b (0.62)	16.36_b (0.82)
Self-Acceptance	13.49_b (0.74)	13.45_b (0.77)	16.63_b (1.01)
PWB Total	85.08_b (2.80)	87.47_b (2.89)	94.68_b (3.83)

Note: SCI = Spinal cord injured. PWB = Psychological Well-Being scales. Means in the same column that do not share subscripts differ at $p < .05$ in a Bonferroni comparison. Listwise $N = 70$.

[a]Adjusted for gender, age, education, race, religiosity, and relationship status.

Discussion

The present research examined hedonic adaptation to extreme events. In two studies, lottery winners, controls, and spinal cord injured participants were found to have no significant differences in their ratings of present happiness and past happiness, supporting the hypothesis that with increased time, adaptation would be complete. Future happiness expectations varied slightly. In Study 1, lottery winners reported significantly higher estimates of future happiness than did controls and spinal cord injured participants, although this anticipation effect was not found in Study 2. Study 2 further confirmed the lack of between-group differences by

establishing that the similar happiness ratings were not products of the particular measures that were employed. Indeed, the relevant regressions were of similar magnitude when the SWLS (cognitive well-being) and PANAS (affective well-being) were substituted for the single-item measures used in the original study. Finally, a measure of eudaimonic happiness also showed no differences between groups.

Thus, the findings of Brickman, Coates, and Janoff-Bulman (1978) were only partially supported. Lottery winners were indeed no happier than controls, but in contrast to the original study, paralyzed individuals were not less happy than either controls or lottery winners. Further, lottery winners did not experience less daily pleasures than control participants as was the case in the original study (in fact, lottery winners reported greater pleasure from daily activities than did SCI participants in Study 2), and individuals with SCI did not exhibit a nostalgia effect by reporting greater past happiness than controls and lottery winners. Finally, results showed that in both studies, lottery winners, people with disabilities, and controls rated winning the lottery as a highly positive event and acquiring a spinal cord injury as a negative event, although the latter finding was more pronounced for lottery winners.

According to adaptation level theory, happiness is always relative to the other stimuli to which it is compared. In the strong version of this view, people are doomed to remain on a hedonic treadmill (Brickman & Campbell, 1971); any gains in happiness will be followed by rapid adaptation back to one's baseline set point (Kahneman, 1999; Lucas et al., 2004) through the processes of contrast and habituation. Conversely, any loss of happiness will also be ameliorated in time. In that the participants with paralysis did not differ significantly in their ratings of well-being, the pattern of findings in the present research falls more into alignment

with this theoretical framework than did Brickman et al.'s (1978) original study. That is, on average, everyone adapted.

With respect to present happiness, as the primary difference between the findings of the current research and those of Brickman et al. (1978) pertained to the spinal cord injured participants, much of the following discussion will center on addressing the possible reasons for this discrepancy. It likely concerns two time-related factors. First, time since injury was greatly increased. Whereas the participants in the current research were, on average, almost two decades post-injury, the SCI participants in Brickman et al.'s study were specifically selected to be no more than 1 year post-injury, and all were still full-time residents in a rehabilitation facility. Thus, none had had the opportunity to reintegrate into their communities, re-establish social networks, nor return to their educational and employment pursuits. All of these factors have repeatedly been shown to increase well-being (e.g., Albrecht & Devlieger, 1999).

Second, the historical time period differed. In the thirty-some years since the original study was published, much has changed with regard to disability rights and awareness. In the 1970s, few laws prohibited discrimination on the basis of disability. The 1990 passage of the Americans with Disabilities Act, and other landmark civil rights legislation, helped change this, and began to chip away at long-held discriminatory practices in education, employment, and other areas affecting civic engagement. Moreover, the difference in historical time has brought with it powerful changes in the conceptualization and definition of disability. At the time of the writing of the Brickman et al. (1978) study, a medical model of disability was predominant. This model portrays disability as a negative health-related problem of the individual, and therefore the onus for adapting to discriminatory attitudes, an inaccessible environment, and reduced opportunities for education and employment is placed on the individual (Albrecht & Devlieger,

1999). Unhappiness is considered to be inherent to disability itself (Bagenstos & Schlanger, 2007). To the contrary, the contemporary social model of disability views disability as an interaction between the condition, the social context in which it occurs, and the environment. According to this model, it is these biases, rather than anything inherent to disability, that serve to lower the subjective well-being of some people with disabilities (Bagenstos & Schlanger, 2007; Pagan-Rodriguez, 2010). Responsibility for adaptation is thus equally shared by the individual and by society. It is likely that an increase in the quality of life of people with disabilities has been made possible by these important time-related changes, and this may be reflected in the considerably higher ratings of present happiness that were found in the current studies.

Although recent research by Lucas (2007a) presents a compelling case against complete adaptation in the case of disability, with findings that appear to contradict those of the present study, the generalizability of Lucas's research is limited due to the definition of disability that was used. Respondents were selected for inclusion in analyses if they had been "officially certified as having a reduced capacity to work or being severely handicapped" (Lucas, 2007a; p. 719), and were asked to rate the extent of their disability, from 0% to 100%. No other information about the nature of their disabilities was recorded. Thus, the defining feature of the participants was that they had been deemed, by government programs, to be incapable of work. This selection bias for individuals who had applied for and were receiving governmental disability benefits may have underestimated the degree to which adaptation occurs because it eliminated people who had successfully reintegrated into their professional lives. The population of people with work limitations is not fully representative of the broader population of people with disabilities. Many people with disabilities, even disabilities that are severe, do work. There

is considerable evidence that employment is associated with substantially higher physical, social, and psychological well-being and better quality of life for individuals with spinal cord injuries (Fadyl & McPherson, 2010; Hammell, 2007; Krause, 1992; McKee-Ryan, Song, Wanberg, & Kinicki, 2005). In the present research, no presumption about employment status was made, and thus both individuals who did not work and collected government disability payments, and those who did work, were included.

Based on the results of Brickman et al. (1978), it could have been expected that the SCI participants would have demonstrated a nostalgia effect. In Brickman et al.'s study, SCI participants rated their past happiness as significantly higher than their present happiness, and significantly higher than did the lottery winners or controls. Brickman et al., posited that this tendency was produced by a sort of contrast effect. That is, by comparing the experience of daily activities with the pleasure brought by these events in their pre-injury lives, their past happiness served as a positive anchor, thereby serving to compromise their present happiness and experience of daily pleasures. However, in the present study, there were no differences in the ratings of past happiness, suggesting that the tendency to idealize the past may dissipate as time since injury increases. Following the reasoning of Brickman and his colleagues, this may have contributed to the higher present happiness and daily pleasure ratings of SCI participants found in the current study.

Given that, in general, the best predictor of the future is the past (Janis & Nock, 2008; Ouellette & Wood, 1998; Webb & Sheeran, 2006), it is worth noting that participants in all groups predicted that their future happiness would be higher than their past and present happiness, producing another sort of contrast effect, an anticipation effect. That is, this contrast may have served to lower their evaluation of present happiness relative to the happier future that

they envisioned, a process called feedforward (Frederick & Loewnstein, 1999). I had hypothesized that, like present and past happiness, no significant differences between groups in anticipation effects would be found. This hypothesis was not supported in Study 1, as spinal cord injured and control participants endorsed significantly lower predictions of their future happiness than did lottery winners. It is possible that the lottery winners experienced greater optimism about their chances of encountering happiness-enhancing events in the future, due to their past experience of good fortune. However, this result was not found in Study 2, in which there were no differences in expectations of future happiness.

In Brickman et al.'s (1978) study, lottery winners reported experiencing significantly less pleasure from daily activities than did control participants. This result, they posited, was largely due to the experience of contrast effects. In contrast to the extremely positive event of winning the lottery, the pleasure they experienced from positive daily activities was diminished. Similarly, in contrast to the positive anchor of their pre-injury lives, the daily pleasure experienced by SCI participants was lower than controls, though this result was only marginally significant. In the present two studies however, these differences were not found (and in fact, lottery winners' daily pleasure ratings were higher than those of SCI participants in Study 2). Using the framework of adaptation level theory, it can be postulated that with time, two processes may take place. First, the event with which current experiences are contrasted may shift. In the case of the spinal cord injured participants, it is possible that rather than using the positive pre-injury past as an anchor, the highly negative experiences closer to the time of injury may become more salient, thus creating a negative anchor in comparison to which current daily events seem more pleasurable. Second, the impact of habituation may overwhelm that of contrast, serving to diminish the effects of highly positive and negative past anchors. In other

words, the emotional experiences of recipients of either good or bad fortune were no longer as strongly influenced by comparisons with the past.

Despite the lack of differences in most forms of happiness, the majority of participants rated winning the lottery as close to the best thing that could happen in life and SCI as close to the worst thing that could happen in life, although the latter finding was less pronounced for SCI participants. These affective forecasting errors, or *mispredictions* of the emotional impact of events, may be the norm rather than the exception. A large and consistent body of research has demonstrated that people are particularly bad at predicting their emotional responses to long-term circumstances (Diekmann, Tenbrunsel, & Galinsky, 2003; Epley & Dunning, 2000; Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000; Wilson & Gilbert, 2003; Wilson & Gilbert, 2005). In a variety of contexts and populations, people display an impact bias, whereby they overestimate the intensity and duration of their emotional reactions to events such as being denied tenure, the break-up of a romantic relationship, or hearing about the death of a young child (Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998). Through overlooking habituation effects, people's adaptation to events is underestimated. For example, people without disabilities consistently predict a lower life satisfaction than that actually reported by people with disabilities (e.g., Ubel, Loewenstein, Schwarz, & Smith, 2005; Ubel, Loewenstein, & Jepson, 2005), a robust phenomenon known as the *disability paradox* (Albrecht & Devlieger, 1999). This finding often holds true even for people who have a high level of contact with individuals with disabilities. For example, Gerhart et al. (1994) surveyed emergency care providers, finding that only 18% imagined that they would be glad to be alive with a high-level spinal cord injury, compared with 92% of individuals with SCI. Indeed, Brickman et al. (1978) reported their critical finding regarding the happiness of spinal cord injured participants in the following way,

"the accident victims did not appear nearly as unhappy as might be expected" (p. 921), which appears to be more a result of the researchers' low expectations than the reality of the disabled participants. Although some researchers have proposed that this "happiness gap" may be due to scale artifacts or other well-being measurement issues such as scale recalibration on the part of the people with disabilities, empirical support for this speculation has been weak (Lacey et al., 2008; Powdthavee, 2009; Ubel et al., 2005). Rather than capturing a surprising empirical finding, it is likely that this difference is due to systematic errors in the judgments of people without disabilities (Ubel, Loewenstein, & Jepson, 2005).

Waterman (2007) suggested that adaptation research is incomplete without consideration of eudaimonic, as well as hedonic, conceptualizations of well-being. Competing hypotheses can be drawn from the well-being literature as to which of the populations represented in the current studies should have experienced higher levels of eudaimonia. On the one hand, Aristotle saw pleasure derived from extrinsic goals, including wealth, as detrimental to ones well-being (Ryan & Deci, 2001). Given this, it could have been predicted that gambling for and receiving a financial windfall could impede, rather than improve, ones level of well-being. With regard to adversity, a substantial literature documents reports of the resultant opportunities for growth and finding meaning in life, which are both critical components of eudaimonia. Perhaps, then, with regard to experiencing high levels of eudaimonia, acquiring a disability could be considered a boon and affluence a barrier. On the other hand, Ryff and Singer (2008) examined socioeconomic and life course correlates of well-being to illustrate that opportunities for eudaimonia are not evenly distributed. She posited that people with greater financial and educational resources have greater opportunities to maximize the opportunities presented in their lives, and thus greater access to eudaimonic well-being. Given this, the chronic stressors

associated with significant disability might overwhelm opportunities for growth and purpose, serving to lower eudaimonic well-being. In resolving this discrepancy, the present research was inconclusive; participants with disabilities' scores on the measure of eudaimonic well-being were neither higher nor lower than those of lottery winners. Nonetheless, future research should try to tease apart the adaptation trajectories and timelines for the two different traditions of well-being.

Limitations and future research

The results of this study should be interpreted with caution for several reasons. The primary limitation of the present two studies is their small sample size. In particular, while it would have been desirable to have examined more than 75 lottery winners, gaining access to this population is intrinsically difficult. Importantly, however, it is not likely that these null results were the result of insufficient power, as several systematic differences were found between the general happiness ratings reported by various demographic groups. For instance, females reported significantly greater present happiness, as did individuals who were in long-term romantic relationships. Further, the sample sizes used in the present research were roughly double those used in Brickman et al.'s study (1978), in which several significant group differences were found.

A second concern raised by Lucas (2007a; 2007b) is that demand characteristics may result in under- or overrepresentations of the impact of a life event on happiness. That is, asking directly about the effect of winning the lottery may artificially and temporarily inflate winners' estimates of their happiness, or conversely, may deflate SCI estimates, simply because it makes the conditions more salient (Frederick & Loewenstein, 1999; Lehman, Wortman, & Williams, 1987; Lucas, 2007b). Indeed, in a study of patients with Parkinson's disease, patients reported lower life satisfaction when the study explicitly referenced Parkinson's than when it did not

(Smith, Schwarz, Roberts, & Ubel, 2006). Following this reasoning, and given that both winning the lottery and acquiring an SCI were explicitly referenced in the respective surveys, differences in the results presented here would be expected to be even more extreme than was actually found. The second study conducted by Brickman et al. (1978), examined whether specifically mentioning that the study involved lottery winners would affect the happiness ratings of controls (versus using the "daily life" explanation). No differences were found, rendering it unlikely that the salience of lottery (or SCI) status impacted respondents' ratings of general happiness or daily pleasures.

Finally, a third limitation of these studies, and indeed of most hedonic adaptation research, is their cross-sectional design. Without prospective longitudinal research, several alternative explanations for the findings cannot be definitively ruled out. It is possible, for example, that there were pre-existing differences in the well-being of the different participant groups. A number of researchers have suggested that certain affect-inducing events are more likely to happen to certain people. For example, using data from their 8-year longitudinal Australian Panel Study, Heady and Wearing (1989) argued that a person's baseline is due in part to their likelihood of experiencing good or bad events, and that unhappy people are more likely than happy people to experience bad events (and vice versa). Tyc's (1992) study of children who had lost limbs due to accidents or disease further supports this contention, in that those children who had been injured in accidents had higher levels of pre-morbid psychological disorders. Thus, differences in happiness may precede events or even be the cause of events (Lucas et al., 2004). If these findings were applied to the present research however, and individuals who acquire spinal cord injuries started with a lower baseline of happiness than did their non-disabled peers, we would have even more reason to expect to have found differences in the current

studies. Conversely, if the people who acquired SCIs were young, active, and athletic before their injuries and had higher than average happiness levels, then the current results would underestimate the decrease in happiness of these participants (Lucas, 2007a).

To examine the impact of potential pre-existing differences in the case of lottery winners, Brickman, Coates, and Janoff-Bulman (1978) conducted another study, in which they compared a sample of lottery players versus nonplayers. Results showed that not only were the demographic backgrounds between groups comparable, there were no significant differences in ratings of general happiness or daily pleasures. Gardner and Oswald also performed checks for pre-existing well-being differences in two studies of lottery players (2001; 2007), finding that players in general did not have average levels of well-being that were either higher or lower than nonplayers. Importantly, as individuals with lower incomes spend a higher percentage of their income on lottery tickets than do wealthier individuals (Haisley, Mostafa, & Lowenstein, 2008), Gardner and Oswald found that the psychological effects of winning occur independently of income (2001; 2007).

The design of interventions that propel more rapid adaptation to bad events & impede adaptation to good events is an area in which future research will be fruitful. Regarding the former, it will be important to investigate how, for whom, and in which domains adaptation is most likely to be complete after negative events. This will facilitate creation of faster, individually-tailored intervention processes that target those least likely to adapt (Boyce & Wood, 2011; Pagán-Rodríguez, 2010). Despite the strong tendency to return to baseline levels of happiness after positive events, several studies have demonstrated that it is possible to raise happiness levels for sustained periods of time. For instance, Fordyce (1977; 1983), performed several successful studies of a program designed to raise happiness levels, and these gains

persisted for over a year. In addition, interventions designed to increase thoughts of gratitude showed increased levels of positive affect (Emmons & McCullough, 2003), and Seligman, Steen, Park, and Peterson (2005) demonstrated the effectiveness of Internet-based interventions to raise happiness levels for up to 6 months. More recently, Sheldon & Lyubomirsky (2012) Sheldon and Lyubomirsky (2012) tested a model of "hedonic adaptation prevention," finding that two largely independent pathways lead to sustained positive emotions from change-derived events. First, engaging with the object or experience (e.g., a new car or a promotion) in new and varied ways led to continued pleasure, and second, making efforts to savor, appreciate, and feel gratitude for the new circumstance prevented rapid adaptation to baseline levels of happiness.

To conclude, I will return to the question posed by Brickman and his colleagues over 30 years ago, "Is happiness relative?" They proposed that this conclusion could be drawn if happiness following extremes of good and bad fortune differed little. That is, rather than being an absolute entity of which some people have more and others less, it could be concluded that happiness is a relative construct that is constantly being measured by the individual against certain reference parameters, such as past experiences or future expectations. If this reasoning is sound, then the findings of the current research suggest that indeed, happiness is relative.

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(*Under review*)

Reduced recognition of negative stimuli predicts less cognitive reappraisal & posttraumatic growth after severe adversity: An eight-year longitudinal study.

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Abstract

Socioemotional selectivity theory contends that as people recognize the inevitable constraint of time imposed by mortality, their goals change, motivating them to focus on emotionally meaningful aspects of life (Carstensen 1993, 1995). The broader cognitive implications of this shift have been explored, finding memorial mechanisms of older adults to be focused on maximizing positive information. Study 1 investigated whether traumatic life circumstances that did not limit the actual amount of time left in life would result in similar memory patterns. Forty-four young spinal cord injured individuals were examined using the same experimental paradigm as Charles and colleagues (2003), and results were compared with the young group of non-disabled adults from this study. Participants who had sustained a spinal cord injury were less likely than non-disabled controls to remember negative images and had relatively enhanced memory for emotionally-relevant images over neutral images. Study 2, an 8-year follow-up with the spinal cord injured participants, investigated the long-term implications of the memory biases found in Study 1. Regression analyses revealed that the lack of a negative memory bias at Time 1 predicted less use of cognitive reappraisal as well as less posttraumatic growth, but did not predict improved well-being.

Keywords: positivity effect, emotion regulation, posttraumatic growth, adversity, disability, spinal cord injury

Reduced recognition of negative stimuli predicts less cognitive reappraisal & posttraumatic growth after severe adversity: An eight-year longitudinal study.

Contrary to stigmatized conceptions of old age, older adults often report high levels of well-being, placing increased emphasis on positive emotional experiences, significant relationships, and meaningful activities (e.g., Carstensen, 1993; 1995; Carstensen, Isaacowitz, & Turk Charles, 1999). These changes have been shown to affect basic cognitive mechanisms and shift the type of information most likely to be attended to and remembered. Specifically, maintenance of positive affect with a corresponding decrease of negative affect is found (Carstensen & Mikels, 2005; Mather & Carstensen, 2005; Quinn, Mather, & Carstensen, 2004).

Like the conventional research on aging, research regarding the impact of traumatic events is largely negative and stresses loss and decline (Tedeschi & Calhoun, 1996). While these events often do produce predictable maladaptive responses that foster further problems (e.g., chronic depression and PTSD), particularly in the early stages, there is also evidence in the literature that indicates otherwise. A growing number of studies have documented reports of positive changes resulting from the psychological struggle with trauma and adversity (e.g., Affeck & Tennen, 1996; Helgeson, Reynolds, & Tomich, 2006; Ironson & Hayward, 2008; Linley & Joseph, 2004; McMillen, 1999; Park, 1998; Tedeschi & Calhoun, 1995; Zoellner & Maercker, 2005), including increased closeness to significant others, finding greater meaning in life, and a reordering of priorities such that greater emphasis is placed on emotionally significant activities.

The outcomes endorsed in studies of the age-related memory biases are strikingly similar to those found in studies of positive growth following severe adversity. Taking these bodies of

research together, it seems reasonable to look for similarities in the associated cognitive processes. That is, can trauma trigger a reduction in negative memory biases?

Socioemotional Selectivity Theory

Socioemotional selectivity theory (SST; Carstensen, 1993; 1995), challenges conventional assumptions regarding aging by de-emphasizing losses, and focuses instead on age-related improvements in emotional experience. According to SST, boundaries on time direct attention to emotional aspects of life, and this relates to aging as chronological age is linked to time left in life. Thus, as people grow older, they increasingly regulate the emotional components of their lives, and therefore intellectual or knowledge-related goals become less important. Emotional goals assume primacy and a more present-oriented state is adopted. Present orientation involves goals related to feeling states, experiencing emotional satisfaction, and deriving emotional meaning. Adopting this time orientation leads older adults to, for example, increasingly prefer interacting with emotionally close social partners instead of less familiar social partners (e.g., Fredrickson & Carstensen, 1990).

The strategies of older adults appear to be quite effective at maximizing positive affect. For example, in an experience-sampling study performed by Carstensen, Pasupathi, Mayr, and Nesselroade (2001), older adults were found to experience negative affect less frequently and for shorter durations than younger adults. The frequency of positive affect, on the other hand, showed minimal change over time (Charles, Reynolds, & Gatz, 2001). Studies examining social reasoning and decision making also suggest improved understanding of basic emotion states well into adulthood as well as better integration of emotion into cognitive processing (Blanchard-Fields, 1986; Labouvie-Vief, DeVoe, & Bulka, 1989; Labouvie-Vief, Hakim-Larson, DeVoe, & Schoeberlein, 1989). Numerous other studies have demonstrated that emotion-focused coping

and understanding advance with age (Diehl, Coyle, & Labouvie-Vief, 1996; Diener, Sandvik, & Larsen, 1985; Folkman, Lazarus, Pimley, & Novacek, 1987; Labouvie-Vief & DeVoe, 1991), and more effective emotion regulation strategies are adopted (Gross, Carstensen, Pasupathi, Tsai, & Gotestam Skorpen, 1997; Vaillant, 1977; 1993; 2002).

Carstensen and colleagues (Carstensen & Turk-Charles, 1994; Charles, Mather, & Carstensen, 2003) have investigated whether the increased salience of emotional goals has broader implications, affecting basic cognitive mechanisms. Using an incidental memory paradigm, Carstensen and Turk-Charles (1994) explored the type of information older and younger adults remember about social interactions. Participants' recall for emotionally laden and emotionally neutral text was examined. As a substantial literature documents age-related decrements in memory with age (Kliegl, Smith, & Baltes, 1989; Light, 1991; Salthouse, 1985), it was not expected that emotion memory would be superior in older relative to younger adults. Rather, it was expected that a memory bias favoring emotional material over neutral material would be apparent. Indeed, each successive age group remembered proportionately more emotional material than nonemotional information from the narratives.

Charles, Mather, and Carstensen (2003) have also tested memory for emotional and neutral images, further investigating the cognitive effects of increased salience of emotional goals. It was hypothesized that in order to be most effective at fulfilling emotional goals, one should have a heightened sensitivity to any emotionally relevant information in ones' immediate environment. For optimal emotion regulation, one should be prepared to deal with negative information as well as embracing positive information. More resources should therefore be devoted to encoding, rehearsing, and retrieving emotionally relevant information than emotionally neutral information.

Results confirmed these hypotheses. For recognition memory, while younger adults showed a memory bias for negative images, middle-aged and older adults had relatively enhanced memory for both positive and negative images over neutral images. This cognitive shift is consistent with the idea that for optimal emotional experience, attention should be oriented towards both positive and negative information at encoding, and suggests that the increased salience of emotional goals leads to changes in the type of information that is most likely to be focused on and later remembered (Charles et al., 2003).

Carstensen and Fredrickson (1998) have disentangled the findings of time left in life from chronological age, relative to socioemotional selectivity theory. A sample of young men who were similar in age to one another, but differed notably in their health status (viz., HIV-negative, HIV-positive, asymptomatic, and HIV-positive, symptomatic) were studied with the same experimental paradigm as younger and older adults. With age held constant, increased closeness to the end of life was also associated with the increased prominence of affect in the mental representations of social partners. Results thus suggested that the perception of limited time, rather than chronological age, is the critical variable in the instigation of these cognitive shifts and challenges a purely developmental account of change (Carstensen & Fredrickson, 1998).

Posttraumatic Growth

Studies of posttraumatic growth (PTG) have examined positive growth-related outcomes following such diverse experiences as breast cancer, HIV, airplane crashes, hurricanes, terrorist attacks, and bereavement (Linley & Joseph, 2004). Typical characteristics of PTG include experiencing greater meaning in life, a new appreciation for the fragility of life, and a reordering of priorities such that greater emphasis is placed on emotionally significant activities like spending time with loved ones (Tedeschi et al., 1998). Indeed, some authors have argued that

experiencing these positive shifts is a central component of psychological recovery from traumatic events (Taylor, 1983; Yalom, 1980). Janoff-Bulman & Berger (2000) pointed out that people do not make such changes "in spite of their losses and sense of vulnerability, but because of them" (p. 39).

Like the research on aging and traumatic events, traditional research regarding the impact of disablement emphasizes loss and decline, and common stereotypes of living with physical challenges are largely negative (Wright, 1983). Traumatic-onset disablement often does produce maladaptive responses, particularly in the early stages (DeVivo, Black, Richards, & Stover, 1991). However, there is also research on disability and other forms of health-related adversity that has documented levels of well-being that are higher than expected. For example, Sprangers & Aaronson (1992) found a tendency for health care providers and significant others to underestimate patients' level of contentment as compared to patients' self-reports. Andrykowski, Brady, & Hunt (1993) found that patients with a life-threatening disease or disability reported a stable quality of life (QOL), and other researchers found that individuals with a severe chronic illness reported a level of QOL that was not inferior to that of less severely ill patients or healthy people (Cassileth et al., 1984).

Research specific to individuals with traumatic-onset spinal cord injuries (SCI), a disability that is most often permanent and seriously impacts most domains of life, has documented similar resilient outcomes. Silver (1982) reported that individuals with spinal cord injuries were very unhappy immediately following their injury, but that 58% stated that happiness was their strongest emotion by the third week after their injuries. Schulz and Decker (1985) studied adults with spinal cord injuries and found that despite the obvious impact their injuries had on them, participants saw themselves on average as being better off than most

people, with or without a disability. In addition, Diener and Diener (1996) reviewed studies that indicated that all American socioeconomic groups score above neutral on life satisfaction measures, as do people with this severe disability.

As in the literature on aging, the appreciation of life's fragility and greater awareness of mortality is a recurring theme in the literature on trauma and posttraumatic growth. Although the actual amount of time left in the lives of individuals who have experienced life-altering traumas is not necessarily affected, the constraint of time imposed by mortality is made salient (Janoff-Bulman, 1985; Lifton, 1976; see also Bower & Sivers, 1998). Janoff-Bulman contends that overwhelming life events force victims to confront their own mortality at a deep experiential level. As individuals' fragility as physical beings becomes obvious through traumatic events, they are forced to recognize the real possibility of annihilation, of serious injury, and their own mortality (1985; 1992). Similarly, Lifton (1976) discusses the "death imprint," or confrontation with one's own mortality, as the defining feature of traumatic events, whether the victimizations are the result of natural disasters, diseases, criminal attacks, or serious accidents. Being faced with the undeniable reality of the fragility of life forces people to reinterpret their world and themselves.

The present research examined whether exposure to severe negative events could lead to enduring cognitive shifts away from negatively valenced stimuli. Most broadly, on the basis of the research on socioemotional selectivity theory and on posttraumatic growth, I predicted that the experience of significant disablement would alter the memory patterns of young spinal cord injured adults relative to their non-disabled peers. Using the same paradigm as Charles, Mather, and Carstensen (2003) to examine the role of emotion for memory of visual information, Study 1 investigated whether the cognitive mechanism posited by socioemotional selectivity theory to

underlie the increased ability to regulate emotions in advanced age appeared in young adults with traumatic-onset spinal cord injuries. In Study 2, an eight-year longitudinal follow-up, I examined the long-term implications of these cognitive shifts.

Study 1

Study 1 examined the hypothesis that for recognition memory, young SCI adults would show decreased memory accuracy for negative images compared with their non-disabled peers, along with maintenance of memory for positive stimuli, as was the case with the middle-aged and older adults in the Charles et al. study (2003). This hypothesis is also consistent with previous findings that with age, negative affect is experienced less frequently (Carstensen, Paspathi, Mayr, & Nesselroade, 2000; Charles, Reynolds, & Gatz, 2001), and positive affect as often (Carstensen et al., 2000). Further, I predicted that young SCI adults would show a bias for emotionally-relevant stimuli as opposed to neutral stimuli, also as postulated by socioemotional selectivity theory (that is, positive and negative images would be recognized with equal accuracy, as was the case with the middle-aged and older adults in the Charles et al. study, and these emotional stimuli would be recognized with significantly greater accuracy than neutral stimuli).

Method

Participants

Eighty-eight research participants were asked to take part in a study examining pictures of a variety of life experiences, and each received $50 for their participation. Forty-four participants with spinal cord injuries (SCI), age 18 to 35 (M = 26.11, SD = 5.50) were recruited from personal referrals within Northern California, Southern California, and the Miami Beach

area. This sample was matched with 44[1] young non-disabled (ND) adults, age 18 to 29 (*M* = 24.52, *SD* = 2.87) from the Charles et al. study (2003), which was comprised of 22 White Americans and 22 Black Americans. Racial composition of the SCI group was limited to White Americans due to reported difficulties in obtaining sufficient numbers of racially diverse spinal cord injured persons[2]. Because of the racial difference between groups, the original ND subjects were reanalyzed with race as a between-subjects factor. No significant interaction of race by emotion was found for either recognition or recall memory, so subsequent analyses of the current study used the full ND group. The age range for SCI participants was extended by six years due to difficulties locating a sufficient number of young individuals who met inclusion criteria for this group.

Fifty percent of each group was female. Socioeconomic status (SES), as determined by the census index of occupations, was also split evenly; fifty percent of each group was blue-collar, the remaining 50% was white-collar. Sex and blue- or white-collar status were distributed evenly across age. Finally, all spoke English fluently.

Although the principal aim of the study was to measure memory for pictorial stimuli, physical health, verbal fluency, and spatial ability were also assessed since each of these factors may influence at least some features of emotional experience (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; McCrae & Costa, 1991; Watson & Pennebaker, 1989). These measures were necessary to ensure consistency between the SCI participants and the age-matched controls used

[1] Data collection for Study 1 was conducted in 2001 and the demographic information and experimental data presented for the non-disabled group reflect that which was collected by June 2001. The Charles, Mather, and Carstensen study was published in 2003; by that time four new participants had been added to their sample of young adults.

[2] According to the Director of Rehabilitation Research at Santa Clara Valley Medical Center Traumatic Brain Injury and Spinal Cord Injury Model Systems of Care (the only Northern California SCI-specific facility), White Americans may be the only sub-population within this geographic area large enough to allow for statistically meaningful analyses (i.e., the SCI database contained only two Black American males that fit inclusion criteria, and no Black American females).

by Charles and colleagues (2003). As can be seen in Appendix 1, the groups were similar in all domains measured.

To increase homogeneity in the spinal cord injured group, all participants had sustained a spinal cord injury through traumatic onset (the result of a specifiable incident and onset), eliminating those who had acquired their disability at birth or through progressive disease. Individuals with traumatic onset spinal cord injuries have been found to have different mental health outcomes than individuals with nontraumatic lesions (e.g., Nielsen, 2003). Further, the SCI literature presents numerous reports of other factors that may influence post-injury emotions and cognitions (see, e.g., Buckelew, Baumstark, Frank, & Hewett, 1990; Bulman & Wortman, 1977; Coyle, Lesnik-Emas, & Kinney, 1994; Krause & Sternberg, 1997; Krause, 1998). These include: time since injury, age at onset of injury, level of injury (tetraplegia versus paraplegia), completeness of injury (complete versus incomplete, an indicator of functional ability), and attribution of blame for injury (self versus other). These factors were represented and distributed across age as evenly as possible. Repeated measures ANOVAs were performed on the SCI data only, using each of these factors as a between-subject variable. None of the factors significantly interacted with valence for recognition memory accuracy, thus data were collapsed across all of the above factors for subsequent analyses.

Measures

International Affective Picture System images (IAPS; Ito, Cacioppo, & Lang, 1998). A set of colored pictures depicting a wide variety of scenes that have been used and validated in many previous studies of human emotional response. These visual stimuli have been standardized on large normative subject samples to ascertain how pleasant/unpleasant (valence) the average individual feels when viewing each image (i.e., the conscious experience of

emotion). The IAPS provides emotional valence ratings for each image, ranging from 1 (*most negative*) to 9 (*most positive*) on a Likert-type rating scale. In addition, participants rated the emotionality of each slide at the end of the study to ensure that the categories were consistent between the groups included in this study. Results indicated no group differences in emotional ratings of the slides, and ratings were consistent with those published in the IAPS. In total, 64 images were used for this experiment; 32 were neutral and 32 were emotional (16 positive and 16 negative). Each picture had a partner, matched on emotional valence and, when possible, similar in content. These were divided into two sets containing 32 images each (16 neutral, 8 negative, and 8 positive). Despite the small number of images in each of the three groups (neutral, negative, and positive), the valence scores differed significantly from each other, $F(2,24) = 503.98$, $p < .001$.

Fifty-four of the 64 pictures chosen for this experiment came from the IAPS set.[3] Because emotional images often contain pictures of people, and neutral images do not, sufficient numbers of images that contained people but were neutral in emotional valence (i.e., had a rating which fell between 4 to 6 on the 9 point scale), were lacking. To control for this possible confound, 10 additional pictures were included in the neutral/person category. These slides included: people standing in line to buy sundries, a group of people sitting at the counter of a bar, and three people putting on scuba gear.[4] Participants rated these images as neutral.

Within each emotion category, half of the images consisted of scenes including people and half were of animals, nature scenes, or inanimate objects. Examples of the pictures

[3] IAPS image numbers: 1440, 1450, 1610, 1710, 1750, 2205, 2340, 2341, 2360, 2370, 2391, 2530, 2830, 2890, 3220, 5001, 5200, 5830, 5831, 5910, 5920, 6560, 6570, 7000, 7006, 7009, 7025, 7031, 7060, 7100, 7130, 7150, 7175, 7180, 7224, 7235, 7360, 7480, 7700, 7710, 7950, 8010, 8160, 9000, 9050, 9220, 9290, 9340, 9411, 9560, 9611, 9622, 9630, 9700,

[4] Additional pictures were people waiting in line at a fast food restaurant, farmers working in a field, a clothes market, people on a boardwalk, scuba divers, a crowd of people, and loggers working in a forest.

containing people included: farmers working in a hay field (neutral), people standing in front of a grave at a cemetery (negative), and a grandfather holding his two grandchildren (positive). Examples of object images included: a wooden stool (neutral), a cockroach on a piece of pizza (negative), and puppies in a basket (positive).

Wahler Health Symptoms Inventory (Wahler, 1973; $\alpha = .88$). A physical symptoms checklist that surveys type and frequency of 42 physical complaints. Frequency ranges from *never* to *every day*, reflecting the daily experiences of subjective physical distress and not health status based on objective health measures or reported diagnosed conditions. The health continuum ranges from 0 to 4 (in which 0 indicates the very infrequent experience of physical symptoms and 4 indicates the frequent endorsement of physical symptoms). It should be noted that because the inventory asks about symptoms, it is insensitive to medically controlled physical conditions and thus several items may have reflected SCI participants' paralysis, rather than health per se.

Wechsler Adult Intelligence Scale - Revised (WAIS-R) Vocabulary Test. A measure of verbal fluency, or the ability to comprehend and use language to express ideas ($\alpha = .81$). Participants are asked to provide definitions for 30 words of increasing difficulty. Answers are scored 0-2 based on sophistication of definition, as outlined in the WAIS manual. This test shows a strong relationship to general intellectual ability and has been used extensively with adults.

Wechsler Adult Intelligence Scale - Revised (WAIS-R) Digit Symbol Task. A measure of spatial ability, in which numbers 1-7 are paired with symbols on a key presented to the participant ($\alpha = .87$). The participant has 90 seconds to go through a grid of 93 numbers and place the corresponding symbol below each number. This measure assesses visual-motor speed

and complexity, and motor coordination. This test also shows a strong relationship to general intellectual ability and has been used extensively with adults.

Emotion Regulation Questionnaire (ERQ; Gross & John; 2003). A total of ten items assess the two emotion regulatory processes of reappraisal (6 items; α = .74) and suppression (4 items; α = .75). Items include: "I control my emotions *by changing the way I think* about the situation I'm in" (reappraisal) and "I control my emotions *by not expressing them*" (suppression). In addition to these general-emotion items, the Reappraisal subscale and the Suppression subscale both include at least one item asking about regulating negative emotion (illustrated for the participants by giving *sadness* and *anger* as examples) and one item about regulating positive emotion (exemplified by *joy* and *amusement*). Items for each subscale are summed.

Center for Epidemiological Studies Depression Scale Well-being subscale (CES-D WB; Radloff, 1977). The complete CES-D is a self-report scale containing 20 items that are symptomatic of depression, with high scores indicating a greater level of depressive symptomatology (α = .76). The CES-D Well-being subscale contains 4 items that are reversed-scored and address general well-being, such as *"I am happy"* (α = .80). Respondents indicate the extent to which they experienced the symptoms over the past week. The CES-D WB was designed to avoid the problem of overemphasizing somatic items that frequently characterize nondepressed older people or people with disabilities (Schulz & Decker, 1985).

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). A 20-item questionnaire assessing emotional experience in general. Participants are asked to indicate on a 5-point Likert-type scale the degree to which they feel each emotion on the list on average. Responses are summed separately for the positive affect (PA; α = .84) and negative affect (NA; α = .88) scales (10 items each) and range from 10 to 50 for each scale.

Procedure

Following initial screening to ensure that subjects met recruitment criteria for the project (e.g., traumatic onset of SCI), participants were interviewed individually for about one hour in the subjects' home, a laboratory room at the Stanford University Psychology Department, or at another mutually agreed upon place. Given the mobility restrictions of this population, the former option was chosen in all but three cases, and all attempts were made to simulate a laboratory-like environment with minimal distractions.

The experimental procedure was identical to that used by Charles and colleagues (2003). After obtaining informed consent and assuring participants that their responses would be confidential, participants were told that they would be observing images presented on a computer screen. An 11 by 8.5 inch computer monitor was placed approximately 1.5 feet in front of them. Participants were shown 32 consecutive images in random order, each remaining on the screen for three seconds interposed with a one second blank screen. Of the 32 images, 16 were neutral and 16 were emotional (8 positive and 8 negative). Subjects were left alone, undisturbed, for the duration of the image set.

Following this initial image presentation, participants completed a demographic questionnaire, the vocabulary and digit-span subscales of the WAIS-R, and the Wahler health inventory, ERQ, CES-D Well-being subscale, and PANAS. After 15 minutes, participants again sat in front of the computer screen and viewed 64 slides, half of which had been seen previously and half of which were novel. The images were presented in random order, and participants were asked to indicate whether or not they had seen each image in the previous set by pressing a key

on the keyboard that represented either a "yes" response or a "no" response[5]. After the participant had endorsed either a yes or no, the next image would appear. Again, participants with paraplegia, like the non-disabled comparison group, indicated their own responses, while participants with tetraplegia were asked to dictate their answers to the experimenter who then pressed the corresponding key. When they were finished with this task, participants were debriefed, thanked, and paid $50.

Results

Results first describe the calculation of recognition memory scores, then examine the relationship between group and valence of remembered images[6]. Scores were analyzed using a repeated measures general linear model with both between- and within-subjects factors. Group (non-disabled or spinal cord injured) was the between-subjects factor, and emotional valence of the image (positive, neutral, or negative) was the within-subjects factor.

Recognition Memory

As in Charles et al. (2003), corrected recognition scores were calculated by subtracting the proportion of false alarms within each valence category (new images incorrectly identified as old divided by the total number of new images) from the proportion of hits within each valence category (old images correctly called old divided by the total number of old images). This corrected for possible response bias, that is, any participants' propensity to identify all images as old, as well as for the larger number of neutral images.

[5] To control for response bias, the order of keys used to indicate "yes" versus "no" was reversed each time. That is, 22 participants used the "L" key to indicate "yes" and the "A" key to indicate "no," while 22 participants used the opposite configuration.

[6] Although Charles and colleagues (2003) analyzed their original data with a second within-subjects variable, people (that is, whether or not people were present in the picture), a significant difference was not found, and thus this variable was not considered in the current study.

To examine the effects of group on recognition memory for valenced images, a 2 X 3 [Group (Non-disabled, Spinal cord injured) X Valence (Positive, Negative, Neutral)] repeated measures ANOVA was computed. As expected, there was no significant difference in the overall amount of pictures correctly remembered by SCI versus ND participants, $F(1, 86) = .64$, $p = ns$, $MSE = .07$. In line with the previous study by Charles and colleagues (2003), a main effect of valence was highly significant, with $F(2, 172) = 17.76$, $p < .001$, MSE = .10, $\eta_{p2} = .17$. To further understand this effect, planned simple contrasts were performed. Overall, participants' memory accuracy for negative pictures was significantly greater than that for either positive or neutral pictures (negative vs. positive: $F(1, 86) = 10.51$, $p < .01$; negative vs. neutral: $F(1, 86) = 43.67$, $p < .001$). In addition, accuracy of memory for positive pictures was significantly greater than that of neutral pictures, $F(1, 86) = 5.30$, $p < .05$, suggesting that emotional pictures were better remembered in general. Means and confidence intervals are provided in Table 1.

Table 1

Mean Proportions Of Correctly Recognized Positive, Negative, And Neutral Images, With 95% Confidence Intervals (CI) From Study 1

Valence[a]	Mean	CI
Positive	.82	(.76, .89)
Negative	.88	(.82, .94)
Neutral	.79	(.73, .85)

[a] $n = 88$ (44 ND + 44 SCI).

Results are illustrated in Figure 1. As predicted, the interaction of group by valence was highly significant, $F(2, 172) = 5.12$, $p < .01$, $MSE = .06$, $\eta_{p2} = .06$. To further explicate this

interaction, a simple effects analysis was performed with SCI and ND participants considered independently. For participants with SCI, recognition memory accuracy for emotional pictures (both positive and negative) was significantly greater than that for neutral pictures (positive vs. neutral: $F(1, 43) = 24.67$, $p < .001$; negative vs. neutral: $F(1, 43) = 25.06$, $p < .001$), but positive and negative pictures were remembered similarly (positive vs. negative: $F(1, 43) = .54$, $p = ns$). For ND participants, however, recognition memory accuracy for negative pictures was significantly greater than that for positive pictures, $F(1, 43) = 13.13$, $p < .01$. Negative pictures were also recognized with significantly more accuracy than neutral pictures, $F(1, 43) = 19.00$, $p < .001$. Memory accuracy for positive pictures did not differ from neutral ones (positive vs. neutral: $F(1, 43) = .21$, $p = ns$). This supports the hypothesis that while young spinal cord injured individuals will show preference for emotionally relevant pictures over emotionally neutral ones at encoding, young non-disabled individuals encode negative content preferentially.

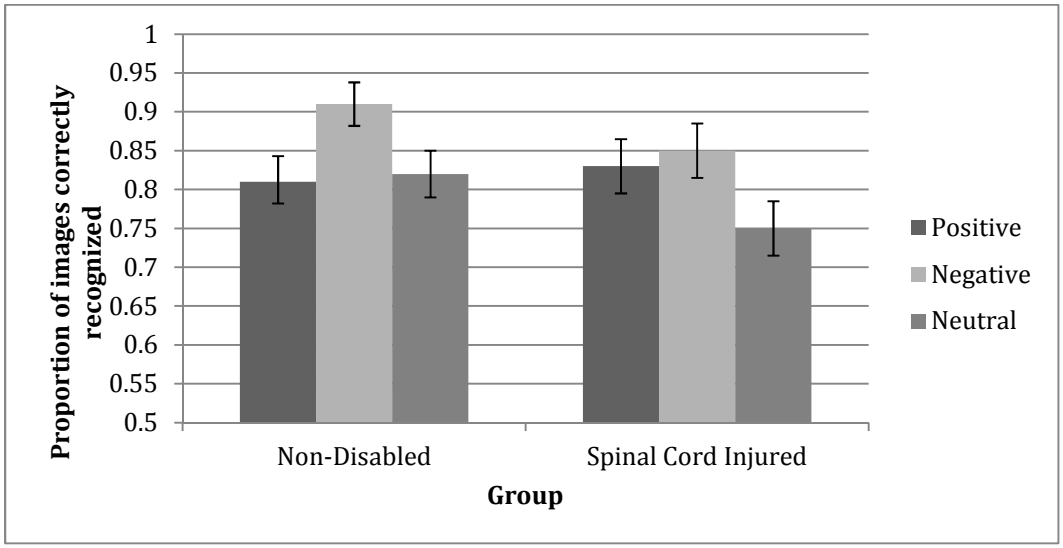

Figure 2.1. Proportion of correctly recognized slides (+ CI) as a function of group and valence of image, from Study 1. $n = 44$ for each group.

These results mirror the findings of the Charles et al. study (2003). While young adults recognized a higher proportion of negative images than positive or neutral (which were recognized with equal accuracy) in the recognition task, middle-aged and older adults performed similarly on the recognition task regardless of image valence. In fact, the SCI findings even more strongly supported the original prediction of socioemotional theory that emotional pictures would be recognized with greater accuracy than those that were neutral (in Charles et al., neutral stimuli were remembered with equal accuracy as emotional stimuli).

Discussion

As hypothesized, young adults who had experienced a traumatic spinal cord injury recognized a lower proportion of negative stimuli, in comparison with their non-disabled peers. Whereas young non-disabled adults showed a bias for recognition of negative images, young individuals with SCI recognized roughly the same proportion of emotional pictures versus neutral images as the middle-aged and older adults in the Charles et al. study (2003). This finding complements studies indicating that older adults, compared with younger adults, are engaging in cognitive processes that may mitigate the impact of negatively valenced experiences (Charles et al., 2003).

A common interpretation of found in the literature on socioemotional selectivity theory is that reduced memory for negatively valenced material (along with maintenance of memory for positively valenced material) functions as an emotion regulation strategy, helping to explain superior emotional well-being in older adults. However, a direct link between the age-related memory biases and well-being has not been explicitly empirically established (Isaacowitz & Blanchard-Fields, 2012). One of the aims of the second study was to test that link, that is, to

ascertain whether reduced negativity bias plays a direct role in emotion regulation and well-being.

The theoretical basis for the original prediction that a negativity bias would not be present in the sample of young adults with spinal cord injuries drew on the construct of posttraumatic growth. Yet, to the best of my knowledge, a reduction in negativity bias and posttraumatic growth have never been empirically linked. Taking the socioemotional selectivity theory and PTG findings together, namely that the phenomena associated with the constructs are strikingly similar, the finding that the negativity bias is absent in young adults with SCI, and the findings of other researchers that PTG-associated changes are elevated in adults who have experienced traumatic events, it seemed reasonable to presume that there would be an association between the two findings.

Study 2

Study 2, a longitudinal follow-up conducted eight years later with the spinal cord injured participants, was designed to investigate several remaining questions: Does memory for negative stimuli have a relation to the use of emotion regulatory strategies in the future? Does the lack of a negativity bias relate directly to well-being? And, is there a relation between the memory biases and posttraumatic growth, as theorized?

Although it was shown in Study 1 that young spinal cord injured adults did not show a bias for recognizing negative images, there was considerable variation in negative memory scores. Therefore, while negativity bias in Study 1 was calculated as a between-group interaction, in Study 2 it was represented as an individual difference variable, and analyzed within the SCI group only, thereby allowing examination of the long-term implications of having more or less of a negativity bias.

To assess emotion regulation, I measured the use of two common emotion regulation strategies -- cognitive reappraisal and expressive suppression – using the Emotion Regulation Questionnaire (Gross & John, 2003). *Cognitive reappraisal* involves construing potentially emotion-eliciting situations in ways that change their emotional impact. For example, rather than viewing an exam as an anxiety-provoking reflection of ones' worth as a student, one might view it as a chance to demonstrate the knowledge they have accrued over a semester of hard work. *Expressive suppression* is a response tendency that involves inhibiting emotion-expressive behavior (Gross, 1998). For example, one might refrain from showing negative emotion while watching a sad movie. In a series of studies, Gross and John (2003) demonstrated that people differ systematically in their use of these strategies, and that these differences impact both affect and well-being. In general, use of reappraisal is associated with greater experience and expression of positive emotion and lesser negative emotion, while use of suppression is associated with lesser experience and expression of positive emotion and greater experience of negative emotion. Overall, reappraisal is positively related to well-being whereas suppression is related negatively.

Method

Participants

After eight years, the original 44 adults with traumatic-onset spinal cord injuries from Study 1 were located and asked to participate in Study 2. Given the time lapse, this posed significant difficulties for locating participants due to changes in addresses, telephone numbers, and last names due to marriage and/or divorce. Intensive searches for current contact information were performed. These included contacting friends and family members using names that were collected during Study 1; past employers; an adoption agency; an address updating service

provided by Experian.com; gmail, hotmail, and yahoo email address identification services; social networking sites such as Facebook, MySpace, LinkedIn, and Plaxo; online person locating sites such as 411.com and USSearch.com; and by calling directory assistance.

All 44 participants were located; one was no longer living, 25 had relocated within the state of California, and three were now living in other states. Following collection of potential contact information, multiple attempts to contact participants were made via postal mail, telephone calls, email, and the messaging functions of social networking sites. Of the 43 living participants, all agreed to take-part in Study 2. However, one individual did not complete the surveys and one participant failed to follow instructions, resulting in a final sample size of 41. As an incentive for participation, a donation of $25 to the Miami Project to Cure Paralysis, a leading program of spinal cord injury care and cure research, was made on behalf of each participant who completed the questionnaire battery.

The final group of 41 participants consisted of 21 women and 20 men. Individuals' socioeconomic status remained largely the same as in Study 1 and was also roughly divided in half (20 blue-collar, 21 white-collar). Total education level had increased, as had the percentage of participants who were married or in other long-term romantic relationships. Age at Study 2 ranged from 26 - 43 years (M = 34.10, SD = 5.50).

Be reminded that participants in the spinal cord injured group had also been selected for a number SCI-specific factors that increased homogeneity in this group and have been found in the spinal cord injury literature to influence various post-injury emotions and cognitions (see, e.g., Coyle, Lesnik-Emas, & Kinney, 1994; Krause & Sternberg, 1997; Krause, 1998). All participants had experienced traumatic-onset injuries and other key factors were represented and distributed across age as evenly as possible. The means, standard deviations, and counts for these

variables in the final sample of 41 participants are as follows: time since injury ranged from 9 – 29 years (M = 15.06, SD = 5.34); age at onset of injury ranged from 3 – 33 years (M = 19.01, SD = 5.48), level of injury (21 tetraplegia, 20 paraplegia), completeness of injury (22 complete, 19 incomplete), and attribution of blame for injury (21 self, 20 other). With the exception of time since injury, for each individual, all factors were stable from Study 1 to Study 2. As in Study 1, analyses were performed using each of these factors as a between-subject variable. None of the factors significantly interacted with emotion regulation, and thus data were collapsed across all of the above factors for subsequent analyses.

Measures

Participants completed an online survey battery consisting of several scales that were administered at Time 1, the ERQ Reappraisal subscale (α = .91), the ERQ Suppression subscale (α = .68), CES-D Well-being scale (α = .77), and PANAS (PA scale α = .89; NA scale α = .92), as well as the Posttraumatic Growth Inventory (described below). The health, vocabulary, and digit symbol tests were not readministered as these measures were included in Study 1 only to ensure consistency between the non-disabled and spinal cord injured samples.

Posttraumatic Growth Inventory (PTGI; Tedeschi and Calhoun, 1996). A 21-item self-report measure of the perception of growth following extremely adverse events (α = .84). Scale items are all positively worded, and respondents are asked to indicate the degree to which each change occurred in their life as a result of their experience. A 6-point Likert response format is used, with response choices ranging from 0 to 5 (0 = *I did not experience this change as a result of my crisis*; 5 = *I experienced this change to a very great degree as a result of my crisis*). The items comprise 5 subscales: (a) relating to others (α = .82), (b) new possibilities (α = .73), (c) personal strength (α = .74), (d) spiritual change (α = .82), and (e) appreciation of life (α = .81).

Procedure

Participants were emailed an internet link to an online survey, created using the program SurveyMonkey.com. To ensure security of online answers, encryption technology was purchased. After a welcome message, survey instructions, and information about whom to contact in case of questions or concerns about the survey, participants were presented with an online consent form on which they selected "agree" in order to proceed to the questionnaires. After completing the measures, participants completed a general demographic questionnaire and an SCI-specific demographic questionnaire. A debriefing screen then appeared, explaining the full purpose of Studies 1 and 2. Participants with limited upper-extremity mobility were given the option of completing the survey by telephone; however, none accepted. Two participants were mailed hardcopies of the questionnaire packet and stamped self-addressed envelopes as they did not have access to the internet. Participants who did not complete the survey within three weeks were sent reminder emails and/or contacted by telephone.

Results

Calculation of memory bias scores, as they pertain to Study 2, is explained below, followed by an examination of the relation between Study 1 memory scores and Study 2 emotion regulation, well-being, and posttraumatic growth scores.

Calculation of Negativity Bias Scores

As in Study 1 and in Charles et al. (2003), corrected recognition scores were calculated by subtracting the proportion of false alarms within each valence category (new images incorrectly identified as old divided by the total number of new images) from the proportion of hits within each valence category (old images correctly called old divided by the total number of old images). Study 2 memory bias scores were calculated by taking Time 1 corrected recognition

scores for negative images and subtracting Time 1 corrected recognition scores for positive images. This method of calculating Time 2 scores resulted in higher scores reflecting greater memory bias for negative images (relative to positive images), and lower scores reflecting less bias for negative images.

Correlational Analyses

To lay a foundation for the Time 2 regression analyses that follow, I first calculated the bivariate correlations between Time 1 negative memory bias, and Time 1 emotion regulation and well-being variables (posttraumatic growth was not measured at Time 1). In this analysis, I calculated the negativity bias variable as described above. As shown in Table 2, negative memory biases were not associated with either emotion regulation strategy or any well-being variable. Consistent with the emotion regulation literature (e.g., Gross & John, 2003), cognitive reappraisal was associated with higher general well-being, and expressive suppression was negatively associated with general well-being and positive affect.

Table 3 displays the bivariate correlations between Time 1 negativity bias and Time 2 emotion regulation, well-being, and posttraumatic growth. Surprisingly, at Time 2, negative memory biases were positively correlated with both reappraisal and suppression. Reappraisal was still associated with higher general well-being, as well as higher positive affect. Suppression was negatively correlated with general well-being. Finally, posttraumatic growth was associated with higher negativity bias and higher cognitive reappraisal.

Table 3

Correlation Coefficients for Time 1 Negativity Bias and Time 2 Emotion Regulation and Well-Being Variables

Variable	*M*	*SD*	1	2	3	4	5	6	7
1. Negativity Bias (2001)	.02	.16	--						
2. Cognitive Reappraisal (2009)	29.44	8.40	.38*	--					
3. Suppression (2009)	12.27	4.44	.36*	.08	--				
4. CES_D Well-being (2009)	8.93	2.82	-.16	.36*	-.38*	--			
5. Positive Affect (2009)	36.63	6.38	.12	.46**	-.08	.54**	--		
6. Negative Affect (2009)	19.05	7.39	-.05	-.26	.04	-.60**	-.56**		
7. PTG (2009)	75.71	16.66	.39*	.55**	.15	.11	.20	-.15	--

Note. CES-D Well-being = *Center for Epidemiological Studies Depression Scale Well-being scale* (CES-D WB; Radloff, 1977). $N = 41$.

* $p < .05$. ** $p < .01$. *** $p < .001$.

In a linear regression analysis controlling for baseline cognitive reappraisal scores, higher negativity bias at Time 1 significantly predicted greater use of reappraisal 8-years later, $B = 16.02$, $\beta = .30$, $t(38) = 2.08$, $p = .04$, $\Delta R^2 = .09$. Higher negativity bias at Time 1 also predicted more use of suppression 8-years later, to a marginally significant degree, $B = 8.44$, $\beta = -30$, $t(38) = 1.91$, $p = .06$, $\Delta R^2 = .08$. Indeed, when negativity bias was regressed on total emotion regulation strategy use, the result was significant, $B = 23.50$, $\beta = .38$, $t(38) = 2.56$, $p = .01$, $\Delta R^2 = .12$, revealing that people with higher negativity bias at Time 1 made greater use of emotion regulation strategies in general at Time 2.

Study 1 negativity bias did not predict higher overall well-being in Study 2. In a regression controlling for baseline CES-D Well-being scores, memory scores at Time 1 did not

significantly predict overall well-being at the follow-up assessment, B = -2.11, β = -.12, $t(38)$ = -0.78, p = .44, R^2 = .13. Similarly, a regression controlling for baseline positive affect scores revealed that Study 1 negativity bias did not predict greater emotional well-being in Study 2, B = 6.32, β =.16, $t(38)$ = 1.03, p = .31, R^2 = .12. Time 2 negative affect, controlling for Time 1 negative affect, was not predicted by negativity bias scores either, B = -0.48, β = -.01, $t(38)$ = -0.09, p = .93, R^2 = .45.

To test whether Time 1 negativity bias scores predicted Time 2 posttraumatic growth, I conducted a simple linear regression. Because the Posttraumatic Growth Inventory (PTGI) was not administered at Time 1, I was unable to control for baseline posttraumatic growth scores, and thus need to be cautious about making strong causal interpretations of the data. Higher Time 1 negativity bias significantly predicted greater Time 2 posttraumatic growth: B = 41.18, β =.39, $t(39)$ = 2.66, p = .01, R^2 = .15.

General Discussion

The most striking finding of Study 1 was that participants with spinal cord injuries did not show a negativity bias in recognition memory for differently valenced images, in contrast to their non-disabled peers. Thus, the experience of severe adversity appeared to be sufficient to affect the amount of negative stimuli (relative to positive stimuli) that was remembered. This suggested that the increased salience of emotion that has been documented in the trauma and posttraumatic growth literature has a cognitive impact, leading to changes in the type of information that is most likely to be remembered.

Socioemotional selectivity theory holds that a primary cognitive mechanism underlying the increased ability to regulate emotions in older age is decreased memory for negative stimuli along with maintenance of or increases in memory for positive stimuli (Charles, Mather, &

Carstensen, 2003). If this is the case, the memory biases may be expected to operate similarly among younger adults who have experienced traumatic disablement. However, at Time 1, no association between cognitive reappraisal and the number of negative images remembered was found, although the negativity bias was positively associated with expressive suppression. In other words, at Time 1, participants with lower negativity bias were not using an effective emotion regulation strategy more, they were using an ineffective emotion regulation strategy less.

Results of Study 2 indicated that those spinal cord injured participants who exhibited a high negativity bias at Time 1 used reappraisal to a greater extent than those who recognized a lower number of negative images. Similar to Time 1, high negativity bias participants also used suppression at Time 2 more than those who had a low negativity bias at Time 1, to a marginally significant degree. That is, eight years later, participants with lower negativity bias were still using the ineffective emotion regulation strategy less than their peers with higher negativity bias, but they were also using the effective emotion strategy less. This suggests that although encountering significant life adversity relates to remembering a lower proportion of negative information, this also predicts less inclination in the future to use common emotion regulation strategies, both those that are effective and ineffective.

It may be the case that the tendency for SCI participants to remember a smaller proportion of negative information than their non-disabled peers leaves them with less of a need to regulate their responses to such stimuli. This likely has both costs and benefits. In general, less memory for the negative information may be adaptive, and indeed less use of suppression has been found to be beneficial in affective and social domains. On the other hand, reduced use of reappraisal when confronted by negative stimuli may leave them vulnerable to future adversity.

These studies also make important contributions to the posttraumatic growth literature.

Study 2 found that less negativity bias at Time 1 predicted less PTG at Time 2. This may appear to be counterintuitive as growth is generally conceptualized in positive terms. However, the PTG findings have been mixed, with some studies showing associations between PTG and measures of well-being, and other studies showing associations with forms of psychological disorders such as PTSD. That a statistically significant relationship was found between the presence of negative memory biases and PTG would seem to support the latter camp. However, without further data, the present research is inconclusive on this point, as no direct associations between PTG and well-being were found.

Another contribution of this research to the PTG literature regards one of the most contentious issues in this body of work: the phenomenon's validity. That is, are people's reports of positive change merely illusory attempts to feel good about oneself or are they reflective of veridical change? The findings from Study 2, that Time 1 negativity bias predicted greater Time 2 posttraumatic growth, would seem to support the latter, in that evidence of a quantifiable change in memorial processes was associated with the phenomenon. This finding also suggests a cognitive mechanism that may underlie PTG. Importantly, this mechanism was present in participants without regard to gender, socioeconomic status, or the many SCI-specific characteristics that were measured. Future research should investigate whether this is the case across different stressor characteristics (e.g., type of trauma, severity) and despite the impact of specific cultural beliefs regarding growth.

The literature on socioemotional selectivity theory often posits that age-related memorial and attentional biases lead to increases in well-being. However, Isaacowitz and Blanchard-Fields (2012) recently pointed out that the supposition that these cognitive processes are linked to the outcome of positive affective experience has not often been tested explicitly. The current

research attempted to test whether reduced negativity bias in recognition memory was directly related to improved well-being, as predicted by the SST research. Intriguingly, despite being related to emotion regulatory strategies, having a lower negativity bias at Time 1 was not associated with measures of general well-being, positive affect, or negative affect at Time 1, nor was it predictive of any of these measures at Time 2.

When held beside the emotion regulation findings of Study 2, however, this may not be surprising. Because reappraisal and suppression were both found to be elevated among those participants with higher negativity biases, it is possible that the effectiveness of one strategy was overwhelmed by the ineffectiveness of the other, thereby canceling each other out with regard to well-being.

The lack of a connection between the negativity bias and well-being may also be understandable in light of the literature on socioemotional selectivity theory. A central theoretical tenet of SST holds that increased focus on emotionally meaningful goals is adaptive for older adults, for whom time left in life is limited, but not for younger adults whose futures are open-ended and thus best served by the acquisition of knowledge and a broad social network. Socioemotional selectivity theory therefore predicts that goals that are in accordance with ones' stage in life will result in greater well-being, while goals that are not in accordance will not, a premise that was supported by this study.

Indeed, Lang and Carstensen (2002) found that a preference for emotion-regulatory goals was associated with greater satisfaction only among those participants for whom these shifts were in alignment with their view of remaining time left to live. Other empirical findings also suggested that a premature focus on emotion regulatory goals would not be associated with well-being in younger adults. For example, Fung and Carstensen (2006) found that shifts toward

emotionally regulatory social relationships were differentially associated with psychological well-being among younger and older adults. Subsequent to the 9-11 attacks and the SARS outbreak, greater salience of emotion corresponded with increased well-being for older adults, but did not for younger adults. Therefore, following the theoretical predictions and empirical findings of SST, it could be argued that less negativity bias, as experienced by the young SCI adults, did not predict greater long-term well-being because it was not adaptive for their stage in life.

An alternative explanation for the lack of congruence between the memory shifts and well-being may be offered by the literature on trauma. An influential theory of trauma posits that the potency of traumatic events lies in their power to assault ones' fundamental assumptions about the world and self. Beliefs about the safety and stability of life help one understand and cope with daily stress and the behavior of others. Janoff-Bulman classified these core beliefs into three primary categories: (1) the world is benevolent, in both impersonal and personal domains, (2) outcomes in the world are distributed according to meaningful principles, e.g., justice, and (3) the self is worthy and deserves respect (1989). These beliefs are difficult to alter substantially, as they are rooted in childhood and have been strengthened throughout life (Janoff-Bulman, 1992). Further, Bower and Sivers (1998) contend that this resistance to change is adaptive, as the conservation of these assumptions is essential for psychological health. The intense emotionality and significance of traumatic events may not allow the victim to easily dismiss the traumatic experience despite these existing schemas, and the assumptions held by survivors may remain altered. Therefore, there might be important differences in the type and consequences of outcomes that are associated with the natural aging process and those which are derived from confrontation with acute trauma. Indeed, Janoff-Bulman (1989) studied the

assumptions of individuals who had experienced traumatic events (including accidents resulting in serious disability) as compared to individuals who had not, and found that although respondents had experienced their victimizations many years prior to the study, they differed in assumptions representing each of the categories studied. Results of the study found that although the basic assumptions of victims did not reflect extremely negative views of themselves or the world, their assumptions were significantly more negative than for nonvictims, and victims were significantly more depressed. A study by Lehman, Wortman, and Williams (1987) further supports the long-term impact of traumatic events. The researchers assessed the mental health and functioning of individuals' who had experienced the sudden death of a spouse or child 4 to 7 years after the loss had occurred. Compared to a group of matched controls, the group who had experienced the losses showed psychological symptoms of continued distress. Lehman and colleagues concluded that traditional views of a timely resolution to bereavement were not supported; rather, findings suggested that exposure to extreme negative events results in enduring changes. Therefore, it is conceivable that the reduced negativity bias of spinal cord injured adults were overwhelmed by enduring changes in their protective assumptions, thereby preventing a corresponding increase in well-being, a possibility that warrants future exploration.

Another possible explanation for the lack of an association between the reduced negativity bias and well-being may lie in the burgeoning research on positive psychological constructs. This literature often divides types of well-being into two categories: hedonic well-being and eudaimonic well-being (e.g., Ryan & Deci, 2001; Keyes, Shmotkin, & Ryff, 2002). Hedonic well-being, the more common conceptualization of well-being, is pleasure-based, consisting of high positive affect and low negative affect. In contrast, eudaimonic well-being is based on meaning and self-actualization. These two types of well-being are associated with

different predictor and outcome variables, and are thus distinct yet related constructs (Ryan & Deci, 2001).

The distinction between these types of well-being was not often made at the time of Study 1. Not surprisingly, the two well-being outcome measures chosen for inclusion in the Charles et al. study (CES-D Well-being scale and PANAS), and therefore administered in the present two studies, were both measures of hedonic well-being. It is possible that the well-being of people who have experienced severe adversity, unlike that of the participants in previous studies, might be better assessed by eudaimonic as opposed to hedonic measures. Indeed, the significant relation between the negativity bias and posttraumatic growth hints at this. Posttraumatic growth often includes a greater sense of meaning in life as well as personal growth, both of which are also core aspects of eudaimonic well-being (Ryff & Keyes, 1995). It is conceivable then, that just as the negativity bias predicted PTG, it may have predicted a type of well-being that includes similar constructs. Further, cognitive reappraisal also shares an emphasis on personal meaning with both eudaimonia and PTG. Therefore, the absence of a relation between the lack of a negativity bias and well-being in Study 2 might be due to an inability of the hedonic measures that were used to capture the type of well-being experienced by spinal cord injured participants. In other words, in Study 2, I might not have been asking the correct question. Rather than asking *if* the reduction in memory for negative stimuli predicts well-being in younger adults who have experienced great adversity, it may be more informative to ask *what type* of well-being the reduction predicts.

Studies by Isaacowitz and colleagues point to several important directions for future research. In a study using eye-tracking to measure age-related attentional biases for positive versus negative images (Isaacowitz, Tone, Goren, & Wilson, 2008), findings suggested that

whether positive biases occurred depended on matching between layers of the emotion regulation process (e.g., attention, cognitive effort, emotional arousal) and dispositional cognitive reappraisal. Only among participants with a higher cognitive reappraisal level was older age related to less cognitive effort and/or emotional arousal toward the negative image compared with younger adults. This study also revealed that for younger adults, cognitive reappraisal was positively correlated with greater negativity bias (i.e., greater pupil dilation to negative images), while for older adults reappraisal was negatively correlated with negativity bias. In a second study (Li, Fung, & Isaacowitz, 2010), that measured age-related mood-congruency for gaze preferences, found that younger adults displayed mood-congruent looking patterns while older adults displayed looking patterns that were more consistent with mood regulation. Going forward, it will be important for research on memory biases for valenced material to measure not only age differences and differences regarding trauma history, but the interaction between emotion regulation strategies and layers of the emotion regulation process as well as the mood of participants when completing the information processing tasks.

A final way in which the series of studies presented in this paper contribute to the literature is that it addresses the well-being of persons with disabilities. In the contemporary United States, some 54 million individuals—almost 20% of the population—have one or more physical, sensory, or cognitive disabilities (Centers for Disease Control and Prevention [CDC], 2006), and half of these are severe, affecting the ability to perform basic life functions, such as walking, seeing, or hearing (CDC, 2006; Department of Health and Human Services, 2001). Further, on the horizon are the anticipated effects of the aging of the “baby boomer” generation, those born between 1946 and 1964, which will result in unprecedented numbers of older adults, including those with disabilities, living in the nation (Administration on Aging, 2001; Campbell,

1996b). According to the National Coalition on Disability and Aging, there are approximately 75 to 85 million Americans -- or one-third of the nation -- who are aging with long-term disabilities or aging into disability for the first time in later life (Campbell, 1996b).

However, despite the increasing prevalence of older adults and people with disabilities and despite the significant challenges they face, remarkably little empirical research exists regarding the cognitive and emotional processes that are most effective for mitigating the impact of disability across the lifespan. Taken together, the research on memory biases, posttraumatic growth, and well-being suggest that cognitive changes, both positive and negative, are an essential component of emotional experience. Research regarding the emotional impact of disablement, like the study of aging, will lead to greater understanding of human behavior in its entirety.

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Appendix 2.1

Demographic Characteristics of the Sample

Characteristic	SCI[a]	ND
Age (years)		
M	26.11	24.52
SD	5.49	2.87
Range	18-35	18-29
Sex (%)		
Male	50.00	50.00
Female	50.00	50.00
SES (%)		
Blue collar	50.00	50.00
White collar	50.00	50.00
Race (%)		
European American	100.00	50.00
African American	0.00	50.00
Health (Wahler)[b]		
M	1.65	0.79
SD	0.59	0.51
Verbal Ability (WAIS-R)[c]		
M	44.73	44.75
SD	11.62	13.02
Range	20.00-68.00	15.00-65.00
Spatial Ability (WAIS-R)[d]		
M	58.83	62.84
SD	12.64	13.22
Range	29.00-77.00	28.00-92.00

Note: ND = Non-disabled; SCI = Spinal cord injured; SES = Socioeconomic status. Wahler = Wahler Health Symptoms Inventory; WAIS-R = Wechsler Adult Intelligence Scale – Revised, Vocabulary Test (Verbal ability) or Digit Symbol Task (Spatial ability). Within the SCI group, the spatial ability task was only completed by paraplegics and high-functioning quadriplegics, *N* = 24, as the participant is required to write and thus needs full hand function.

[a] *n* = 44 for each group. [b] Higher scores indicate greater level of health. [c] Higher scores indicate greater verbal ability. [d] Higher scores indicate greater spatial ability.

Appendix 2.2

Demographic Characteristics of the Spinal Cord Injured Group in Study 1

Characteristic	*n* = 44
Level of injury (%)	
Quadriplegic	50.00
Paraplegic	50.00
Completeness of injury (%)	
Complete	54.55
Incomplete	45.45
Person responsible for injury (%)	
Self	47.73
Other	52.27
Time since injury (years)	
M	7.01
SD	5.19
Range	1.00-21.00
Age at injury (years)	
M	19.26
SD	5.73
Range	14.00-32.50

(*In press*)

Adaptation to adversity: Does money or meaning matter more?

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Abstract

When it comes to subjective well-being following challenging life circumstances, what matters more, material affluence or a sense of meaning in life? Two studies examined this question, using both longitudinal and cross-sectional data. Participants in Study 1, an eight-year longitudinal study, were 39 wheelchair-using adults with spinal cord injuries. At Time 1, participants were administered a survey battery in which they were asked to indicate their annual household income, as well as to complete measures of general well-being, depressive symptomatology, and positive and negative affect. Eight years later, participants completed an online survey that included these same measures. As hypothesized, multiple regression analyses, controlling for Time 1 levels of each well-being variable, as well as gender, age, education, health, religiosity, marital status, level of injury (tetraplegia or paraplegia), and time since injury, revealed that Time 1 income did not predict future subjective well-being on any measure. Study 2 used a cross-sectional sample of 75 individuals with spinal cord injuries to test whether the absence of an income-happiness relationship replicated, and to evaluate the prediction that meaning would have a strong relation with subjective well-being. Participants completed an online battery of questionnaires that included a measure of meaning in life, general well-being, depressive symptomatology, and positive and negative affect. Multiple regression analyses again revealed that income did not predict any of the measures that were administered. Meaning, however, had a strong relationship; indeed, all subjective well-being variables were predicted by greater presence of meaning in life.

What makes life most worth living? More specifically, when it comes to well-being following challenging life circumstances, what matters more, money or a sense of meaning in life? We all know the axiom, “You can’t buy happiness.” However, the pursuit of financial gain is ubiquitous. We live our lives as though, indeed, money does matter. According to polls by Bloomberg.com, two-thirds of people would take a three-month vow of silence for $20,000. Twenty-five percent of people would abandon all of their friends and church for $10 million. And one in fourteen people would murder for that amount (Kanner, 2001).

And perhaps money matters more in challenging times. Indeed, researchers (Kahneman & Deaton, 2010), found that the emotional strain of negative experiences, such as getting divorced or being ill, appear to be exacerbated by being poor. For example, among people with asthma, 41% of low earners reported feeling unhappy, compared with about 22% of the wealthier group. Angus and Khaneman wrote: "More money does not necessarily buy more happiness, but less money is associated with more emotional pain" (p. 16,492).

There is also some evidence to suggest that in the case of acquired physical disability, which is the focus of the present research, money matters. Smith and colleagues (2005) found that participants who were above the median in total net worth reported a smaller decline in well-being after a new disability than did participants who were below the median. They posited that financial resources could help people deal with the practical demands of disability, and served as a psychological buffer by minimizing the negative impact of physical declines. For example, affluence can facilitate better access to high-quality health care, accessible transportation, and the ability to make expensive home and workplace modifications.

However, there is also research that draws this relationship into question. Using a cross-sectional between-groups design, I recently repeated what has been called “most famous article

in the psychological literature on wellbeing" (Schkade & Kahneman, 1998), a study from the 1970s that compared the happiness levels of lottery winners, people with paralysis, and controls. In the original study, lottery winners were no happier than controls, but both groups were much happier than the paralyzed participants. However, in my replication study, I made several important modifications, namely increasing the average time since injury from 1 year to 20 years, and found that, with time, the paralyzed participants adapted and were no longer any less happy than the lottery winners (Hayward, 2012).

Study 1 of the present research explores this discrepancy further, using 8-year longitudinal data to test the predictive ability of affluence on subjective well-being (SWB). Study 2 incorporates the construct of meaning-in-life, testing the hypothesis that meaning matters when it comes to subjective well-being after significant life challenges.

Study 1

Method

Participants

Forty-four participants with spinal cord injuries (SCI), age 18 to 35 (M = 26.11, SD = 5.50) were recruited from personal referrals within Northern California, Southern California, and the Miami Beach area in 2001. Fifty percent of participants were female. Socioeconomic status (SES), as determined by the census index of occupations, was also split evenly; 50% of each group was blue-collar, the remaining 50% was white-collar. Sex and blue- or white-collar status were distributed evenly across age. Racial composition of the SCI group was limited to White Americans due to difficulties in obtaining sufficient numbers of racially diverse spinal cord injured persons in the geographic areas in which recruitment took place. Finally, all spoke English fluently.

To increase homogeneity, all participants had sustained a spinal cord injury through traumatic onset (the result of a specifiable incident and onset), eliminating those who had acquired their disability at birth or through progressive disease. Further, the SCI literature presents numerous reports of other factors that may influence post-injury well-being (e.g., Buckelew et al., 1990; Bulman & Wortman, 1977; Coyle et al., 1994; Krause & Sternberg, 1997). These include: time since injury, age at onset of injury, level of injury (tetraplegia versus paraplegia), completeness of injury (complete versus incomplete, an indicator of functional ability), and attribution of blame for injury (self versus other). These factors were assessed and included as covariates in regression analyses.

After eight years, the original 44 participants were located and asked to complete the follow-up questionnaire. Given the time lapse, this posed significant difficulties for locating participants due to changes in addresses, telephone numbers, and last names due to marriage and/or divorce. Intensive searches for current contact information were performed. These included contacting friends and family members using names that were collected during Study 1; past employers; an adoption agency; an address updating service provided by Experian.com; gmail, hotmail, and yahoo email address identification services; social networking sites such as Facebook, MySpace, LinkedIn, and Plaxo; online person locating sites such as 411.com and USSearch.com; and by calling directory assistance. As an incentive for participation, a donation of $25 to the Miami Project to Cure Paralysis, a leading program of spinal cord injury care and cure research, was made on behalf of each participant who completed the questionnaire battery in full.

All 44 participants were located; one was no longer living, 25 had relocated within the state of California, and three were living in other states. Following collection of potential contact information, multiple attempts to contact participants were made via postal mail, telephone calls,

email, and the messaging functions of social networking sites. Of the 43 living participants, all agreed to take-part in the study. However, one individual did not complete the surveys, one participant failed to follow instructions, and two participants did not provide their income data, resulting in a final sample size of 39.

The final group of participants consisted of 20 women and 19 men. Individuals' socioeconomic status remained largely the same as in 2001 (19 blue-collar, 20 white-collar). Total education level had increased, as had the percentage of participants who were married or in other long-term romantic relationships. Age at Time 2 ranged from 26 - 43 years (M = 34.10, SD = 5.50).

The means, standard deviations, and counts for the spinal cord injury-specific variables in the final sample of were as follows: level of injury (20 tetraplegia, 19 paraplegia), completeness of injury (21 complete, 18 incomplete), and attribution of blame for injury (20 self, 19 other). Time since injury ranged from 9 – 29 years (M = 15.06, SD = 5.34); age at onset of injury ranged from 3 – 33 years (M = 19.01, SD = 5.48). With the exception of time since injury, for each individual, all factors were stable from Time 1 to Time 2.

Measures

Most of the subjective well-being literature divides happiness into two components: emotional well-being and cognitive evaluations of life satisfaction. Emotional happiness refers to the frequency of the experience of two factors: high positive affect (e.g., excitement, enthusiasm, inspiration) and low negative affect (e.g., fear, guilt, anger). Cognitive happiness refers to a global sense of satisfaction with life. Research has shown these constructs are correlated, yet distinct (e.g., Diener, 1984). For instance, Diener, Ng, Harter, and Arora (2010) found that income is strongly associated with evaluations of life satisfaction but only modestly related to

positive and negative affect. Thus, measures of both affective and cognitive well-being were included in this study.

Demographic characteristics. All participants were asked to fill out demographic information, including their annual household income. Income was measured using a scale from less than $10,000 to greater than $150,000, in $10,000 increments. In addition, participants were asked to indicate years of education, whether or not they were religious/spiritual, and whether or not they were married. These factors have been shown to influence SWB in the extant literature (see e.g., Argyle, 1999), so they were later used as covariates in the regression analyses.

Affective happiness. The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) was administered to measure affective happiness in general. The PANAS is 20-item questionnaire in which participants are asked to indicate on a 5-point Likert-type scale the degree to which they feel each emotion on the list on average. Responses are summed separately for the positive affect (PA; $\alpha = .92$) and negative affect (NA; $\alpha = .90$) scales (10 items each) and range from 10 to 50 for each scale.

Cognitive happiness. The *Center for Epidemiological Studies Depression Scale Well-Being subscale* (CES-D WB; Radloff, 1977) was administered to measure cognitive life satisfaction. The CES-D is a self-report scale containing 20 items that are symptomatic of depression. The CES-D Well-Being subscale contains 4 items that are reversed-scored and address general well-being, such as *"I am happy"* and "*I enjoyed life*" ($\alpha = .80$). Respondents indicate the extent to which they experienced the items over the past week.

Procedure

At Time 1, after obtaining informed consent and assuring participants that their responses would be confidential, participants took part in a two-stage memory experiment that was part of a separate study. During the 15-minute break between experimental stages, participants were asked to complete a battery of paper-and-pencil questionnaires. Participants with limited hand function due to tetraplegia were asked to dictate their responses, which were recorded by the experimenter.

After Time 2, participants were emailed an internet link to an online survey, created using the program SurveyMonkey.com. To ensure security of online answers, encryption technology was purchased. After a welcome message, survey instructions, and information about whom to contact in case of questions or concerns about the survey, participants were presented with an online consent form on which they selected "agree" in order to proceed to the questionnaires. After completing the measures, participants completed a general demographic questionnaire and an SCI-specific demographic questionnaire. A debriefing screen then appeared, explaining the full purpose of the study. Participants with limited upper-extremity mobility were given the option of completing the survey by telephone; however, none accepted. Two participants were mailed hardcopies of the questionnaire packet and stamped self-addressed envelopes as they did not have access to the internet. Participants who did not complete the survey within three weeks were sent reminder emails and/or contacted by telephone.

Results and Discussion

Preliminary correlational analyses of the relation between income, well-being, and other demographic variables were conducted to test for associations closer to the time of injury. That is, these analyses explored whether finances served to buffer the blow of traumatic injury. As can be seen in Table 3.1, annual household income was not related to any measures of SWB or any

demographic factor with the exception of physical health (greater income was associated with better health).

Table 3.1

Bivariate Correlation Coefficients between Time 1 Demographic Variables and Time 1 Well-Being Measures in Study 1

Variable	PA	NA	CES-D WB	Income	Gender	Age	Edu.	Health	Relig.	Marital Status	Tetra/ Para	Comp/ Inc.	Self/ Other	TSI
PA	--													
NA	-.55**	--												
CES-D WB	.59**	-.59**	--											
Income	-.24	-.08	.15	--										
Gender	.06	.06	.02	-.08	--									
Age	.45**	-.20	.44**	-.01	-.13	--								
Education	.27	-.20	.13	-.10	.07	.22	--							
Health	.07	-.52**	.15	.39*	-.35*	-.05	-.19	--						
Religiosity	-.03	.20	-.14	-.18	.40*	-.15	.34*	-.14	--					
Marital St.	-.03	.03	.28	.06	-.01	.11	.19	-.02	.00	--				
Tetra/Para	.08	-.13	.07	.05	.44**	.19	-.20	-.03	.11	-.32*	--			
Comp/Inc	.11	-.07	.25	-.03	-.23	.02	-.24	-.01	-.25	.13	-.18	--		
Self/Other	.02	.03	-.07	-.15	.23	-.34*	.17	-.26	.22	.11	.07	-.08	--	
TSI	.33*	-.28	.36*	.08	.15	.49**	.24	.25	-.01	.13	.06	.12	-.16	--

Note: PA = positive affect, NA = negative affect, CES-D WB = Center for Epidemiologic Studies Depression Scale Well-Being subscale, Tetra/Para = tetraplegic or paraplegic, Comp/Inc = complete injury or incomplete injury, Self/Other = who was responsible for the SCI, TSI = time since injury. $N = 39$
* $p < .05$ ** $p < .01$ *** $p < .001$.

Thus, close to the time of injury, money did not seem to serve as a psychological buffering factor as was suggested by Smith et al. (2005). On several measures of subjective well-being, greater age and better health did appear to provide a buffer. Interestingly, there was also no relation between SWB and almost all SCI-related factors. For example, contrary to common assumptions, paraplegics were not happier than tetraplegics, and people with incomplete injuries were not happier than those with complete injuries. The exception to this pattern was time since injury: greater time since injury was associated with higher positive affect and greater general well-being, likely because the process of adaptation was at a more advanced stage.

To test the hypothesis that higher income at Time 1 would not predict greater well-being at Time 2, I conducted multiple regression analyses, controlling for Time 1 levels of each well-being variable, as well as gender, age, education, health, religiosity, marital status, level of injury (tetraplegia vs. paraplegia), completeness of injury (complete vs. incomplete), and time since injury. As revealed in Table 3.2, Time 1 household income did not significantly predict future subjective well-being on any measure.

Table 3.2

Summary of Regression Analyses for Time 1 Income on Time 2 Well-Being Variables in Study 1

Variable	*B*	*SE B*	*β*	*t*	*p*
Positive Affect	0.09	0.26	.05	0.33	.74
Negative Affect	-0.17	0.21	-.09	-0.79	.43
Cognitive Well-being	0.16	0.10	.23	1.51	.14

Note. Listwise deletion, $N = 39$.

Study 2

If money doesn't predict well-being after adversity, what does? Following in the tradition of Victor Frankl and his seminal writings on Logotherapy (1963), there is a growing literature on the importance of having a sense of meaning in life for adjustment to stressful life circumstances (see, e.g., Park & Folkman, 1997). Both theoretical work and empirical studies of positive sequelae following challenging events have burgeoned over the past two decades (e.g., Affleck & Tennen, 1996; Helgeson, Reynolds, & Tomich, 2006; Linley & Joseph, 2011; McMillen & Cook, 2003; Park, Cohen L.H., & Murch, 1996; Tedeschi & Calhoun, 1995; Zoellner & Maercker, 2006). In fact, while only a small percentage of people experience psychopathology after adversity, the majority of people report benefits and a high quality of life (Quarantelli, 1985).

Indeed, in the specific case of spinal cord injury, it has been found that although people who had sustained spinal cord injuries reported strong negative emotions 1 week after their accidents, only 7 weeks later they reported that their strongest emotion was happiness (Silver, 1983). Further, Schulz and Decker (1985) studied adults with spinal cord injuries and found that participants saw themselves on average as being better off than most people, with or without a disability. Additionally, in a study of people with high-level tetraplegia by Gerhart and colleagues (1994), 92% of participants reported that they were glad to be alive and 86% of the group reported that they enjoyed an average or better than average quality of life.

Based on the work of Janoff-Bulman (2002) and others, demonstrating that finding meaning is an important way in which individuals integrate challenging life events into their belief systems to reestablish a positive view of the world, I hypothesized that meaning would predict subjective well-being post-injury. Indeed, there is evidence that post-paralysis, following a period of increased attempts to make meaning, people shift their priorities from materialistic

goals to more meaningful ones, that meaning in life is a mediator of adjustment after spinal cord injury, and importantly, that the belief that ones' life is meaningful is strongly associated with post-injury psychological well-being (Thompson, Coker, Krause, & Henry, 2003). Based on these findings, and the findings of Study 1, I used a cross-sectional sample of people with spinal cord injuries to test, first, the replicability of the lack of an income-SWB relationship, and second, the prediction that meaning would have a stronger association with SWB than would income.

Method

Participants

Seventy-five[7] spinal cord injured participants were recruited from personal referrals within the Greater Boston area, social networking websites, an SCI online forum, and a national organization that puts out a monthly online newsletter addressing the concerns of people with disabilities. All were full-time wheelchair users. The average age of participants was 44 years (*SD* = 13.00), 45% percent of participants were female, and 71% of participants were White. About half of the participants (48%) responded that they were religious or spiritual, 48% of participants were in committed long-term romantic relationships, and average years of education was 16.74 (*SD* = 3.26). All of the above variables were included as covariates in regression analyses.

At the time of their injuries, the spinal cord injured participants were, on average, 25.26 years old (*SD* = 14.88), with an average of 18.50 years (*SD* = 12.62) since their injuries. Fifty-five percent of participants were paraplegics, and 45% were tetraplegics. Forty-nine percent had complete injuries while 51% were incomplete. Fifty percent had been injured in car accidents,

[7] Although 75 participants took part in this study, when listwise deletion was used in analyses, 15 of these participants were eliminated for not providing responses to one or more of the demographic questions that were entered as covariates.

12% had been injured in diving accidents, and the remaining 38% were fairly evenly split between other sport and recreational activities, disease/illness, falls, gun violence, and other causes.

Measures

As in study 1, I assessed positive and negative affect with the PANAS, and general cognitive well-being using the CES-D Well-Being subscale. In addition, the following measure of meaning was administered.

Meaning. The Meaning in Life Questionnaire, Presence of Meaning Subscale (MLQ-P; Steger, Frazier, Oishi, & Kaler, 2006; $\alpha = .93$) is a measure of the existence of general meaning and purpose in a person's life. Respondents indicate the degree to which they agree with each of 5 statements, such as "My life has a clear sense of purpose." This measure has shown high test-retest reliability as well as convergent and discriminant validity (Steger & Kashdan, 2006).

Procedure

All recruiting materials contained a website address to the online survey. After reading informed consent and instruction pages, participants were asked to complete a battery of questionnaires that assessed aspects of psychological well-being for people with spinal cord injuries. As an incentive for participation, a donation of $25 to a charity of the participant's choice was made for completing the questionnaire battery in full.

Results

Multiple regression analyses were conducted to test whether subjective well-being was predicted by income and/or a sense of meaning. As Table 3.3 reveals, income did not predict any of the measures of SWB that were administered. It is also noteworthy that, as in Study 1, injury severity (whether one is a paraplegic or a tetraplegic), had no relation to subjective well-being.

Presence of meaning, however, had a strong relation to SWB. Indeed, all well-being variables were predicted by greater presence of meaning in life.

Table 3.3

Summary of Regression Analyses for Income and Meaning on Well-Being Variables in Study 2[a]

	Income[b]				Meaning[c]			
Variables	*B*	*SE B*	*β*	*p*	*B*	*SE B*	*β*	*p*
Positive Affect	0.09	0.31	.04	.77	0.70	0.11	.66***	.000
Negative Affect	0.13	0.27	.07	.62	-0.32	0.12	-.36*	.01
Cognitive Well-being	0.16	0.12	.19	.20	0.15	0.06	.36*	.01

Note. Listwise deletion, $N = 60$.

[a]Controlling for: gender, age, education, health, religiosity, marital status, level of injury (tetraplegia vs. paraplegia), completeness of injury (complete vs. incomplete), and time since injury.

[b]Annual household income.

[c]Meaning in Life Questionnaire, Presence of Meaning subscale (MLQ-P).

*$p < .05$. **$p < .01$. ***$p < .001$.

Discussion

To date, most scientific research on psychological responses to adverse circumstances has focused on negative sequelae, such as depression, PTSD, and substance abuse. Common conceptions of trauma in general, and disability in particular, mirror this agenda. However, "exposure to stressful life events does not invariably end in depression and despair; it may also act as a catalyst for a reevaluation of one's goals and priorities and a reexamination of one's sense of self" (Bower et al, 1998, p. 984). Indeed, the findings of the present studies, in

conjunction with previous research, provide evidence for a link between subjective well-being and the presence of a sense of meaning in life following adversity.

On the other hand, in contradiction to common conceptions regarding what will make one happy and the behaviors that result from these beliefs, a link between income and SWB was not found in either study. This is particularly noteworthy given the aforementioned literature that demonstrates a link between affluence and well-being in challenging life circumstances (e.g., Kahneman & Deaton, 2010; Smith et al., 2005). This discrepancy may be due to differences in measures used and populations examined.

The present research was not without limitations. In particular, the relatively small sample size necessitates using caution in drawing conclusions from the data, and findings should be considered preliminary. In addition, although a substantial number of potential demographic confounds were taken into account, it is possible that the observed findings may have been the result of other, unexamined psychological variables. Further, the generalizability of findings may be limited due to the nature of participants; middle-aged, White individuals constituted the majority of both samples. It is also true that findings cannot necessarily be generalized within the population of people with disabilities. To increase the homogeneity of the samples, individuals who had acquired their disability at birth or through progressive disease were not included; these types of disabilities may be associated with different emotional and cognitive processes. Finally, due to the cross-sectional nature of Study 2, causality cannot be addressed unambiguously.

Despite these limitations, this series of studies adds credence to the growing literature on the importance of meaning, particularly after adverse life experiences. The consistent connection between well-being and the presence of a sense of meaning in life needs to be taken seriously in psychological interventions designed to ameliorate suffering after trauma. Relatedly, in that

these interventions may promote attempts to find meaning after misfortune, future research needs to explore the process of *searching* for meaning. Evidence suggests that these two meaning-related constructs, search and presence, have different relations to subjective well-being, with presence being positively correlated and search being negatively correlated (Steger et al., 2006). If this is the case, practitioners will need to proceed with caution during the first phase of meaning construction, perhaps providing additional support while an individual moves through this challenging process.

Finally, on both an individual and societal level, it could be argued that priority shifts should be encouraged. Given that ones sense of well-being is not, or only weakly, related to material wealth and consumption, perhaps our use of time is misguided. The premium placed on the acquisition of financial affluence appears to run contrary to our own sense of well-being. That is, to answer the question with which I began this article, meaning matters more.

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General Discussion

Taken together, the three studies presented in this dissertation are loosely organized around the exploration of a central theme: well-being after disablement. This work was inspired by the burgeoning research on posttraumatic growth and the possibility for the positive that it invokes. Traditionally, the study of traumatic events has almost exclusively focused on negative sequelae, e.g., depression, substance abuse, and suicidality. The tide is turning however, and a broad base of empirical evidence now demonstrates that trauma can be associated with a wide variety of responses, including growth. Further, high levels of subjective well-being are not only possible following adversity, they may be the norm.

The first paper provided a test of whether high well-being holds true even for people who have experienced significant disability, thus setting the foundation for exploring posttraumatic growth and related constructs. Of wheelchair-using adults with traumatic-onset paralysis the study asked, “Are they happy?” To provide an answer, two studies attempted to replicate the classic 1978 study by Brickman, Coates, and Janoff-Bulman on the relative happiness of individuals with spinal cord injuries, lottery winners, and controls. In contrast to the original study, when time post-injury was extended by two decades, no differences in happiness were found. This is remarkable given the current strong bias towards researching psychopathology post-SCI in the medical and rehabilitation literature, and suggests that a more balanced approach towards what is assumed and studied needs to be taken. Further, this study contributed to the current debate around hedonic adaptation, that is, whether adaptation is ubiquitous and complete, by suggesting that in both regards, it is.

With the potential for high levels of well-being established, the second paper turned toward an examination of factors that may undergird this phenomenon. Using an eight-year

longitudinal design, an examination of the emotion regulation abilities that underlie the positivity effect was presented. Relevant to the overall focus on posttraumatic growth in this dissertation were two findings: first, the result that Time 1 positivity effect scores significantly predicted Time 2 posttraumatic growth, would seem to support the validity of PTG in that it provides evidence of a quantifiable change in memorial processes that is associated with advances in emotion regulation abilities. Second, this finding suggests a cognitive mechanism that may underlie PTG, namely a reduction in memory for negative stimuli. Importantly, this mechanism was present in participants without regard to gender, socioeconomic status, or the many SCI-specific characteristics that were measured.

Paper 3 built on this exploration of posttraumatic growth by focusing on one critical component of PTG: a sense of meaning in one's life. That trauma may act as a catalyst for a reevaluation of one's priorities and a subsequent shift towards greater emphasis on those that are meaningful is critical to the PTG construct, and thus a special focus on it and its relation to subjective well-being seemed warranted. Indeed, the findings of the present studies, in conjunction with previous research, provide evidence for a link between subjective well-being and the presence of a sense of meaning in life following disablement. In contradiction to common conceptions regarding what will make one happy however, a link between income and SWB was not found in either of the two studies that made up this paper.

Implications

Finding evidence that contradicts current assumptions regarding the well-being of particular groups is important for several reasons. Errors in judgment about the well-being of others can have serious implications if translated into action (Schkade & Kahneman, 1998). A striking example of the deleterious consequences of these mispredictions is provided by a study

of emergency medical responders (Gerhart, Koziol-McLain, Lowenstein, & Whiteneck, 1994). Most responders incorrectly assumed that survivors of severe SCI would experience a low quality of life in contrast to the vast majority of participants with SCI, and almost a third of responders stated that these estimates of life quality should be a factor in determining the aggressiveness of life-saving efforts. A significant proportion of the emergency care providers reported that they would not opt for use of techniques aimed at saving their lives in the event of their own injury, reporting that death is preferable to life with a disability (Gerhart et al., 1994; Dunnum, 1990). In other words, there were associations between perception and practice: those with the bleakest outlooks of life after SCI were least likely to favor aggressive intervention.

Moreover, underestimates of the capacity of individuals with disabilities to adapt can influence public willingness to endorse policies that will create greater well-being. If disability is thought to be an inherently negative life circumstance that results in permanently lowered life satisfaction, then it makes less sense to allocate scarce funds to interventions and assistive technologies aimed at improving quality of life. For instance, Bagenstos & Schlanger (2010) argue for reform to the legal practice of awarding hedonic damages to people with disabilities, as these awards are based on the presumption that disability inevitably lowers quality of life. They further argue that hedonic damage practices in the legal system encourage "pity and distract attention from societal choices that create disability" (p. 134). Evidence of the ability of people with disabilities to achieve high levels of happiness may help to impel reform of these practices.

It is also important to note what is *not* implied by this research. Brickman & Campbell's early work (1971), and much subsequent research, describes adaptation as inevitable. This, if true, does not bode well for attempts to raise well-being in individuals and society. But evidence for complete adaptation to disability, improved emotion regulation abilities, and a sense of

meaning does not mean that changes in social and economic policies relevant to disability are not necessary. Indeed, the *World Report on Disability* (WHO, 2011) reveals that of the more than one billion people in the world who have disabilities, 110-190 million encounter significant difficulties in their daily lives. Improvements in the quality of life of people with disabilities may serve to reduce the time required for hedonic adaptation and increase the possibility for growth.

Limitations & Future Research

Despite the contributions mentioned above, this research program is not without limitations. The two primary limitations of the present research, small sample sizes and the inability of cross-sectional designs to eliminate alternative explanations, have been discussed earlier and thus will not be repeated here. Another limitation of cross sectional studies, however, is that they may obscure individual differences in the speed and extent of adaptation because they explore between-group variation. There is considerable individual variation in the data, indicating that adaptation is not inevitable for all people. Indeed, Boyce & Wood (2011), using data from the German Socio-Economic Panel Study (GSOEP), found that adaptation to disability was significantly moderated by predisability personality. Over a 4-year period, people moderately high on the personality trait of agreeableness showed signs of complete adaptation to disability. In contrast, moderately disagreeable individuals had life satisfaction levels that were 0.32 standard deviations lower than their more agreeable counterparts. Prospective longitudinal studies also permit the tracing of the temporal course of adaptation. Mancini, Bonanno, & Clark (2011) used latent growth mixture modeling to examine a subset of the GSOEP, finding that despite the general trend to maintain a stable level of happiness, there were multiple and divergent trajectories in response to marriage, divorce, and bereavement. Identifying the factors

that contribute to this variability is an important goal for future research (Lucas, Clark, Georgellis, & Diener, 2003; Lucas, 2007a).

Relatedly, averages obscure differences in adaptation to different domains of life. For example, although people may adapt completely in terms of global life satisfaction, adaptation may not be complete in all domains, such as health, income, work, and leisure. Pagan-Rodriguez (2008) found that although overall life satisfaction returned to pre-disability levels after about 5 years, it was not complete in all domains measured, and different domains adapted at different rates. On average, leisure satisfaction returned to pre-event levels after 3 years, satisfaction with household income and housing took about 5 years, and health satisfaction never adapted. Similarly, Powdthavee (2009) found that complete adaptation occurred in all domains for individuals with mild disabilities, but for people with severe disabilities, adaptation in the health and income domains remained incomplete. Future research that measures well-being in different domains of life will provide a more accurate and nuanced picture of the life satisfaction of people with disabilities.

As only one type of disability was included in these studies, the generalizability of the findings may be questioned. However, disability is not a monolithic category. As Pagan-Rodriguez (2010) points out, an important limitation in the few extant prospective longitudinal studies is that the data set (the German Socio-Economic Panel, GSOEP) does not permit disaggregated analysis by disability. Just as White, Black, and Asian participants, for example, cannot be assumed to have the same cognitive and emotional experiences, neither can people with different disabilities (and just as there is variation within ethnic categories, there are vast differences within each type of disability). For instance, individuals with psychosocial disabilities encounter the most negative societal attitudes and have the lowest rate of

employment; thus they might have lower probabilities of adaptation, a difference that would be obscured by averaging across disabilities (Pagan-Rodriguez, 2010). Therefore, although it may limit the generalizability of results, to provide the most stringent test of adaptation, different types of disabilities must be examined individually. Investigations of posttraumatic growth and different types of disabilities are rare; future research will be necessary to ascertain whether the findings in this paper are applicable to other groups of disabilities.

Although concerns regarding the utility of using self-report scales to measure happiness are beyond the scope of this paper, it bears noting that high correlations have been found between self-reported life satisfaction and relevant measures, including length of life, sociality, extraversion, happiness of close relatives, skin-resistance measures of response to stress, risk of heart disease, sleep quality, memory measures, and electroencephalogram measures of prefrontal brain activity (Kahneman, & Krueger, 2006; Pagan-Rodriguez, 2010). Further, the ratings of clinical interviews, evaluations of close friends and family members, daily mood reports, and emotion memory test results, converge well with SWB scores (Pavot, Diener, Colvin, & Sandvik, 1991; Sandvik, Diener, & Seidlitz, 1993; Seidlitz & Diener, 1993). In addition, a high level of stability has been found in these correlations over time and across populations (Diener & Such, 2000). Indeed, leading spinal cord injury researcher Marcel Dijkers remarked, “the only relevant measure of quality of life is [a person’s] own judgment as to their well-being” (1997; p. 829).

Finally, it will be important for future disability and posttraumatic growth research to take into account cross-cultural differences. In the current research, the samples were largely White and were drawn from a single Western nation. However, 80% of people with disabilities

live in developing countries, in which perceptions of disability are likely to vary. Although intended to apply to people from all cultures, such generalizability needs to be established.

I will now bring this dissertation full circle by returning to the topic that inspired it, the general validity debate in the posttraumatic growth literature, and offer proposals for research that can further this important topic.

Promising Directions for Future PTG Validity Research

Presence of cognitive processing variables. Tedeschi and Calhoun (2004) have long argued that cognitive processing of, or deliberately ruminating upon, the impact of traumatic events on individuals' lives is necessary for veridical growth to occur (Calhoun, Cann, & Tedeschi, 2010; Triplett, Tedeschi, Cann, Calhoun, & Reeve. 2011). There is growing evidence for this proposition. Bower et al. (1998) found that recently bereaved HIV-positive men were more likely to report growth and had lower mortality over 2 to 3 years if they showed evidence of cognitive processing. O'Cleirigh et al., (2003) found that while emotional expression (writing about a trauma) was good, cognitive processing was better. Participants whose essays about trauma showed evidence of positive cognitive appraisal change had better maintenance of CD4 cells and better control of the HIV virus. In fact, cognitive processing mediated the relationship between emotional expression and the maintenance of healthy disease progression markers over 2 years in a diverse sample of 135 people. Helgeson et al.'s (2006) review of 87 cross-sectional PTG studies showed that PTG was related to more intrusive and avoidant thoughts about the adversity. Experiencing intrusive thoughts about a stressor may be a sign that people are working through the implications of the stressor for their lives, and this process may then lead to growth. Indeed, it seems likely that a period of cognitive processing of the stressor may be necessary for growth to occur and it is difficult to imagine that true growth can occur within days of a

traumatic event. Future studies aimed at assessing the validity of self-reported PTG should incorporate this factor.

The relations between cognitive processing, severity of event, and degree of positive change experienced as a result, should also be investigated further. Calhoun and Tedeschi (2006) concluded that greater stressfulness correlates with and can predict greater growth. That is, higher amounts of growth are generally reported by individuals who report higher amounts of stress or threat because they stimulate greater amounts of cognitive processing. However, once the requisite threshold of stress has been reached to trigger the cognitive engagement necessary to produce growth, it is not clear whether the relationship between stress and growth continues to be linear. Several studies have suggested that, in some contexts, a curvilinear relationship exists between the traumatic "dose" and the growth response (Fontana & Rosenheck, 1998; Kleim & Ehlers, 2009; Linley & Joseph, 2004). Although very low doses of stress may not stimulate cognitive processing, extreme doses of stress may simply overwhelm people's psychological resources (Calhoun & Tedeschi, 2006), and thus the highest amounts of growth might be reported, and most valid, with intermediate amounts of stress.

Co-occurrence of positive and negative outcomes. Negative outcomes following a traumatic event and growth are not mutually exclusive; that is, posttraumatic growth and negative sequelae such as posttraumatic stress disorder (PTSD) may be distinct, independent constructs, rather than continuous dimensions. Indeed, study respondents often report co-occurrence of highly negative states, such as PTSD, with PTG (Dekel, Ein-Dor, & Solomon, 2011; Park, 1998; Tedeschi & Calhoun, 2004; Tedeschi & McNally, 2011), and this relationship can persist over decades (Holgerson, Boe, & Holen, 2010). As PTG is prompted by events that are severe enough to challenge ones fundamental assumptions, these type of events are also

likely to cause more severe distress (Bower, Moskowitz, & Epel, 2009). Dohrenwend et al. (2004), suggested that there is a complex interplay between mental illness, such as PTSD, and positive growth processes that minimizes disability in postwar role functioning. They further suggest that this complicated mix of positive and negative appraisals may be the most adaptive outcome in that it reflects the reality of the experience yet provides an opportunity for growth.

Cheng et al.'s (2006) findings regarding people affected by the SARS outbreak, i.e., that people who reported benefits in the absence of costs scored higher on a test of social desirability, suggest that one promising way of distinguishing between illusory and veridical growth would be to assess the reporting of both costs and benefits in response to a stressor, with the endorsement of both being most likely to reflect true growth. If individuals report their positive experiences with equal accuracy as their negative experiences, this would seem to provide evidence for non-biased self-perception.

Concluding Remarks

In addition to asking whether posttraumatic growth is illusory or veridical, it is important to answer another question: Why does it matter? There are several reasons for making this distinction. First, to provide a comprehensive theory of trauma, it is necessary to have a thorough understanding of the sequelae, both negative and positive. Given all that is known about the negative consequences of trauma and adversity, researchers now need to learn why, when, and for whom, negative events sometimes lead to positive outcomes.

Whether PTG is illusory or veridical also has implications for clinical interventions and practice. It is possible that there are subgroups within individuals who report growth; some may experience veridical growth outcomes while others do not, and the ones who experience veridical growth may be the ones who benefit most. It is also possible that in the period immediately

following the traumatic event reports of positive growth largely serve as coping mechanisms, whereas with increased time, real positive changes can occur in the person or in the person's life (e.g., their relationships with others). That is, for some people, a period of palliative, illusory PTG may precede a subsequent period of actual transformative growth (Tedeschi & McNally, 2011; Zoellner & Maercker, 2006). If it is found that these positive changes are in fact reflected in external reality, then it would be important to understand how they have come about so that processes of stimulating these changes in others may be developed (Park, 2009). To the extent that clinical work can foster the propensity to experience veridical growth, as opposed to the illusory sort, it would seem beneficial to be able to distinguish between the two.

I will conclude by putting forth the idea that posttraumatic growth research in general, and research concerning people with disabilities specifically, is not just interesting in an academic or intellectual sense; it has important implications for individuals and societies. Common assumptions that remain unexamined by the tools of science can be harmful, and providing a more balanced view of traumatic experience, one that includes the possibility for positive outcomes, may serve to enlighten conventional wisdom. If the assumptions regarding individuals who are facing challenges are incorrect, so too will be the policies, services, and mental health practices that grow out of these assumptions.

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